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ABSTRACT

The book contains papers and discussion summaries from a conference on the relationship of the arts to cognition and basic skills and the relevance of art and aesthetics research to art education. The papers suggest researchable questions in the arts and provide examples of ongoing studies in these areas. These questions are grouped into three main areas of inquiry: The Arts as Symbolic Representation; Definitions of the Underlying Processes in Cognition; and, How the Development and Acquisition of Cognitive Skills Relate to the Arts. The first area encompasses questions about the arts as symbolic representations, styles of world-making, symbol systems and standards of objectivity, the conveyance of meaning and truth, and the role of aesthetic criteria. The second area of inquiry focuses on cognitive operations, basic cognitive skills, acquisition of skills, and the nature of cognitive processes in the arts. The final area, handled less comprehensively than the first two, deals with enhancement of the processes of making and knowing about the arts, and the amount of knowledge required to create art. (Author/BC)

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SECOND YEARBOOK ON RESEARCH IN ARTS AND AESTHETIC EDUCATION

The Arts, Cognition, and Basic Skills

Based on a conference held at Aspen, Colorado, June 19-25, 1977.
Co-sponsored by CEMREL, Inc.,
and The Education Program of
The Aspen Institute for Humanistic Studies
with support from **The National Institute of Education**

Stanley S. Madeja, *Editor*

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I never saw a Moor—
I never saw the Sea—
Yet know I how the Heather looks
And what a Billow be.
Emily Dickinson

If you knew everything,
then you couldn't do anything new.
A Child

Stanley S. Madeja

Introduction

The papers published in this yearbook were commissioned for the purpose of investigating the nature of cognition and the development of basic skills as these phenomena relate to the arts. They were delivered and discussed at a conference titled "The Arts, Cognition, and Basic Skills," which was held in Aspen, Colorado, in June 1977. The intent of the conference was to create a framework allowing for a systematic investigation of these phenomena as they apply to instruction in the arts. The papers in this yearbook suggest researchable questions in the arts and provide examples of ongoing studies in these areas. The purpose of this Introduction is to use the papers and the conference discussions to specify some areas for further research in the arts and cognition, and to elaborate on their implications for instruction.

The design and content of this the Second Yearbook on Research in the Arts and Aesthetics were generated at a planning conference where participants also defined three main areas for inquiry related to the topic of "The Arts, Cognition, and Basic Skills." (Participants in the planning conference are listed in the front of this book.) The first area of inquiry, "The Arts as Symbolic Representation," generated such questions as: Are the arts symbolic representations? Are there styles of world-making? Within the symbol systems created by the arts, what is the role of standards of objectivity? How do the symbol systems represented by the arts convey aspects of meaning and truth? What is the role of aesthetic criteria in a symbol system? How do symbols in the arts function in experience and in artistic, scientific, and practical cognition? Do these symbols become a language of art that possesses its own symbol system and structure? What are the types of symbols that make up that structure?

The second area of inquiry outlined for the conference, "Definition of the Underlying Processes in Cognition," contained the following questions: Are there underlying non-domain-specific processes that are common to individuals and are they realizable across various domains of knowledge? Are there cognitive operations that are specific to arts activities? Can these be thought of as basic cognitive skills? If there are symbolic competencies connected with the arts, how basic are they, and how do they relate to the acquisition of basic skills? What is the nature of the cognitive process involved in making and knowing the arts? Is it similar to or different from general cognition? If cognition in the arts is different from general cognition, does it contribute to or hinder other ways of knowing? Can the arts provide symbolic competencies that are basic to the basic skills?

The third area was characterized as "How the Development and Acquisition of Cognitive Skills Relate to the Arts." The following questions were posed to the participants: Does the possession of cognitive skills enhance the processes of making or knowing about the arts? Do such skills enhance or detract from the understanding and appreciation of the art object? Does the acquisition of cognitive skills contribute to the aesthetic responsiveness of the individual or to the ability to value the aesthetic? How much knowledge, comprehension, appreciation, and understanding of the arts does the creation of the art object or performance require? Does knowledge about the arts and their formal structures contribute to the total art experience and to the development of what might be termed critical skills? What is the effect on general cognition of the popular arts and the mass media?

The original plan was to follow as closely as possible the three areas of content defined by the planning group. In actuality, the papers and speeches comprehensively covered only the first two areas, focusing on the questions of the arts as symbolic representation and the role of underlying processes in cognition. The third area of interest, the acquisition of cognitive skills and their contribution or relationship to the arts, was not as deeply probed. The shortfall in this area surely indicates the state of research in arts education rather than any lack of concern or attention on the part of educators. Few studies deal with instruction per se below the graduate level — with the notable exceptions of the papers in this volume by Bamberger, Stein, and to some extent, Kennedy. Consequently, this area is still in a category for further inquiry and research.

This Introduction is based on more than simply the contents of the papers and speeches delivered during the conference. Each of the presentations—with the exception of those by Broudy, Engel, and Hochberg—was accompanied by a formal response from a member of the conference. The responder's role was that of critic and reactor. These responses as well as the exchange of views they generated informed and provoked the meetings of five discussion groups whose members worked throughout the conference to prepare reports on an assigned topic. (Lists of discussion group members can be found on pages 261 to 263.) An introduction to the individual speeches and papers and their authors follows.

Harry S. Broudy, Professor of Philosophy and Education Emeritus at the University of Illinois, whose remarks opened the conference, states that he was struck by the degree to which it was generally taken for granted that the dichotomy between cognition and emotion and feeling is no longer an issue. He characterizes the dichotomy as having two sides: one being the traditional distinction between reason and intellect on the one hand, and the emotions or passions on the other; and the other being the difference between the ordinary philosophical meanings of the cognitive and affective terms and their technical meanings in aesthetic discourse. He notes that although aesthetic theories differ in the relative emphasis they place on informing, pleasing, and moving (as do different art styles), few if any aestheticians would argue that any work of art lacks all three characteristics altogether. Broudy locates the problem of aesthetics in epistemology—in the form that information or knowledge takes when the communicator is a work of art. He notes that most in the field concede that the knowledge communicated by a work of art is not outright propositional knowledge, and that nevertheless, "It is generally agreed that works of art do say something, that they are expressive, that in some sense they communicate even as they please and move." Broudy concludes with the suggestion that art is considered an indirect communication at least in part because of its still ambiguous role in daily life and the unresolved philosophical questions about its nature.

Martin Engel, Advisor for Arts and Humanities for The National Institute of Education, states the case for research on the topic of the arts and cognition. The nucleus of this paper was used as a charge to the participants at the planning meeting. Engel reviews several current positions on cognition, symbolism, and structuralism such as those of Perkins in *The Arts and Cognition* and Scholes in *Structuralism in Literature*. His purpose is to alert the field to the ways in which research in cognition can inform and enhance the arts. He describes what he terms "the cognitive paradigm" based on the theories of semiotics, structuralism, and cognitive psychology, and he draws from it implications for arts research and theory development. Engel also speculates that the lack of a sound cognitive theory about the arts as unique combinations of mental skills makes significant change in education curricula virtually impossible. This lack of a guiding theory for instruction in the arts contributes to the disarray and narrowness in the teaching of the subject matter. He contends that the arts can become more central to the curriculum if they, like other disciplines, are treated as knowledge and ways of knowing.

Anita Silvers, Professor of Philosophy at San Francisco State University, examines the grounds for and against recent anticognitive approaches to art and aesthetics, and comes out for the cognitivists. One of the fundamental tasks for any cognitive approach to art is to provide an account of how the art object, when construed as a cognitive device, is correlated with its reference. Anticognitivists take the proposition as the paradigmatic cognitive device and ostention as the paradigmatic cognitive operation. For a basic cognitive device to be useful, they assume, it must be possible to present both it and its reference to learners in such a way that the correlation is established. If this is not possible, then the device does not suffice as a part of cognition. While arguing for the cognitivists' position on the arts and aesthetics, Silvers systematically analyzes the anticognitivists' objections to the idea that art can be a cognitive process. She concludes by saying that if there is merit in the position that she has developed, we should be prepared to reexamine our approach to arts education. If children's learning in art is dependent on their ability to sort among the alternative features or references available in art objects, then their learning is affected by their interest in the abstract notions to which the art objects refer. If this is the case, we can enhance appreciation of art by intensifying children's concern with the notions art exemplifies. Thus, art cannot be appreciated in isolation, and aesthetic education should be integrated with general education.

David Olson, Professor of Applied Psychology at the Ontario Institute for Studies in Education, looks at the three primary functions of language: the interpersonal or rhetorical function, the logical or truth function, and the aesthetic function. We may examine any symbolic structure in terms of these three criteria; that is, the effect the author or artist wishes to produce on the listener: the interpersonal rhetorical function; what the symbolic structure in fact states, expresses, represents, or exemplifies: the logical ideational function; and what the aesthetic effect on the listener or viewer is: the aesthetic function. Olson says that art is not necessarily distinctive in the symbols it employs, but in the way those symbols are utilized. The arts serve cognition in two ways: through the application of aesthetic criteria to symbolic expression, and in the case of elaborate and specialized symbolic systems, by a focus on the surface structure properties of the medium.

Brent Wilson, Professor of Art Education at The Pennsylvania State University, and Marjorie Wilson, consultant for the Brookline, Massachusetts Public Schools and the National Assessment of Educational Progress, provide an answer to the question, Are the arts symbolic representation? They use current cognitive theories to give tentative explanations for the symbolic processes in art and to describe how they see the arts as ways of making the world. We use the physical world to construct our perceptions of natural objects and our graphic depictions of objects, and also our memories of both—all of which phenomena may function as symbols. Each symbol then has potentially the same status, at least as far as our reality is concerned. The Wilsons provide a very straightforward answer to the question, What do the symbols of the arts represent? They say, "The symbols of the arts represent the symbols of the arts." They also note that the arts are abstract, paradigmatic, and prototypical. The body of the paper supporting these conclusions is a description of a number of visual narratives exemplifying some of the transactions among symbolic modes.

Mihaly Csikszentmihalyi, Associate Professor and Chairman of the Committee on Human Development at The University of Chicago, explores the limitations of an exclusively rational cognitive mode from an evolutionary perspective, and then from the viewpoint of individual development. He asks, "In what sense can one say that the process of coding and decoding visual images is a cognitive process?" Scientific reasoning acquires its power by the clarity and precision of its symbolic coding, while the power of art develops out of its ability to represent in symbolic form experiences that are "ambiguous, contradictory, or not fully emergent in consciousness." Artistic cognition provides the unique variations that are essential to the evolution of knowledge. Knowledge of human experience produced through art is transmitted through the culture and across generations allowing us to share our experiences and to share in those of others. For the individual, art fulfills two parallel functions, embodying both reflective knowledge about inner states and constructive knowledge about the individual's power to affect a personal environment. In conclusion, he acknowledges that he has provided a map based on quite abstract ideas, and that the task at hand is to read the map in the context of the real terrain of the classroom.

Howard Gruber, Professor of Psychology and Director of the Institute for Cognitive Studies at Rutgers University, Newark, New Jersey, discusses the relationships between aesthetics and science, emotion and cognition. Gruber describes a case-study methodology for investigating these relationships using his study of Darwin and scientific creativity as an example. The development of an individual's creative life over time should be examined for the purpose of extracting useful information. The interest lies in determining what fosters cognitive development and in defining how it proceeds, although this sometimes takes place through very mundane and ordinary operations. To Gruber, one of the supreme pleasures afforded by the creative life in any sphere of activity is orchestrating the network of enterprises one operates for a particular purpose, and knowing one is doing just that. A means that individuals use to accomplish this orchestration is the use of what Gruber terms "images of wide scope"—in Darwin's case, an image of the tree of nature that he refined and redefined throughout his life. We all use images of this kind to give meaning and structure to our thoughts and actions. The task of research is to provide a taxonomy of growth applicable to such domains of experience, feeling, and emotion. Explication and understanding of these phenomena can provide and hold a balance between emotion and cognition.

Julian Hochberg, Professor of Psychology at Columbia University, has adapted a speech he delivered at the conference on visual arts and the structures of the mind into the paper published in this volume. He distinguishes three broad functions in the visual arts: representation or the use of visual displays to convery information about the physical disposition of objects, people, and events; expression or the communication of feelings and identity; and aesthetic value or the beauty, rightness, or what he terms the "intrinsic interestingness" of the work of art. Hochberg relates these three functions to the major theories of perception, which, he notes, rely heavily on cognitive explanations. He discusses representation (the production of surrogates) in the contexts first of classical psychological theory from Berkeley to Helmholtz, then of Gestalt theory as an alternative, and finally of Gibson's theories about the amount and kind of information available in the world and pictures of it. Hochberg states that if the theory of perception outlined by Gibson is completely true, there is nothing he can call cognitive involved in perceiving pictures. In Hochberg's definition of perception as the intentional formulation and testing of sensory expectations or mental structures, the task of grasping and testing the schema, not the complexity of the stimulus or the arousal, is the basis of aesthetic value. Here is a cognitive theory of aesthetic value for psychologists and educators as well as art theorists to deal with. Unless the viewer is educated to the tradition in which and out of which the artist is making his or her statement, and unless the viewer has the intention of perceiving the fit between his or her visual vocabulary and the work of art, there is no aesthetic response. Hochberg asks for research into the mental structures that provide a pictorial vocabulary for perception and for acquisition of further knowledge and for development of a testable theory relating cognition and feeling in such a way that the expressive effect of the parts and whole of the object can be related.

Jeanne Bamberger, Associate Professor in the Division for Study and Research in Education at the Massachusetts Institute of Technology, characterizes her paper as parables of cognitive dissonance. Bamberger describes three examples of her research to differentiate intuitive and formal musical knowing: the story of three students at different stages of their musical education who listen to and describe a piece of music; the story of a group of children who are asked to draw rhythmic patterns corresponding to a tune they have heard; and finally, that of Jeffrey and the growth of his musical understanding and abilities. Intuitive musical knowledge is present in both children and adults before the advent of formal training. Bamberger asks how it changes with training and what kind of transitions and reconstructions accompany the learning. Teaching and testing have given priority to formal descriptions of phenomena and their underlying strategies of representation, and they have been defined as basic skills. Yet, by emphasizing the formal descriptions we fail to recognize the need to coordinate the student's powerful intuitive strategies with the formal descriptions that we expect him or her to cope with in school. In this sense, the teaching of music fails, not the child's learning. Research on teaching should work toward a better understanding of the coordinating schemas through which an individual learns to integrate, and thus to enrich, both the powerful intuitive strategies and the equally important formal strategies and descriptions that are associated with schooling and adult thinking.

John M. Kennedy, Associate Professor, Life Sciences, Scarborough College, University of Toronto, proposes that researchers investigate identification as a phenomenon central to the arts as well as to child psychology, psychotherapy, and sociology. He looks at identification from two sides: an examination of the opportunities for identification allowed in different arts media and a more formal analysis of its essential characteristics. Using many actual examples of identification drawn from films and popular media, Kennedy discusses the opportunities supplied by the arts for identification, the process of identification itself, and the place of identification via the arts in human psychology, particularly child psychology. He concludes by answering the question, What then is identification? Insofar as the arts are concerned, it is accepting another person as related to oneself so that the person's good fortune is desired and his or her misfortune is avoided. Kennedy offers the proposition that the arts, and the arts alone, can give us the opportunity in a short timeframe to discover and to examine what it is like to be someone else, something else, somewhere else.

Nancy L. Stein, Associate Professor of Research at the Center for Reading of the University of Illinois, Urbana-Champaign, contributes a paper on the comprehension and appreciation of stories. She based the studies that she describes in her paper on the assumptions that goal-directedness and cause-and-effect relationships are at the core of the definition of a story and that the schematic representation of stories can guide the coding and retrieval of information encoded in the story. The ideal story structure, according to her grammar, contains all five categories of episodes in a story: the initiating event; an internal response that includes the goal of the protagonist; an attempt or overt action by the protagonist; the consequence; and the reaction stating the character's response to the goal attainment. The results from her first series of experiments indicate that certain techniques hinder young children's understanding of stories. She concludes that if we are to enable children to understand stories as an art form, we must begin to define exactly what the various types of artistic techniques are and exactly how they are understood at different age levels.

Research Issues in Cognition and Their Implications for Arts Instruction

In reviewing the papers and the discourse of the conference, it becomes evident that the hoped-for path from theory to practice is neither straight nor smooth. What emerged were four issues for research, each of which carries implications for classroom instruction and further study. The major issue at Aspen was whether the arts were to be viewed from a cognitivist or noncognitivist point of view. Allied to these discussions was the question of the role of expression in the arts. The three other issues that surfaced were the relationship of developmental theory in psychology to the arts, the relationship of perception to cognition and the arts, and the possibility of transfer between the arts and general cognition. A discussion of these issues from the point of view of their implications for research and teaching follows.

Cognitive and Noncognitive Approaches to the Arts

If a theory of instruction in the arts is to emerge, part of its formulation would rest on whether the arts are viewed from a cognitive or a noncognitive position. The cognitive position says: The arts are cognition, they are part of a larger domain of knowing, they provide a unique content for that domain, but they are a subset of a higher order of things. The noncognitive or anticognitive argument says the arts are unique entities in themselves having their own structure, their own mode of inquiry, and their own cognitive system. Either way, there are implications for instruction: on one hand, the arts are treated as part of a more general theory of instruction; on the other, they emerge as separate entities requiring their own theory. The dichotomy between the cognitive and noncognitive approaches to art and the question of their relationships to teaching and learning were articulated during the discussions of one of the study groups at Aspen.* The group members were particularly interested in the issues of epistemology and symbolic processes within the arts. They noted that the noncognitivist position asserts that knowledge is general, art is particular, therefore, art is not knowledge. The cognitive position is based on a different assumption; that is, that general knowledge exists tacitly in the form of mental structures and schemata. In order for these schemata to be made known to the individual, they must be given concrete form. The arts provide one means by which these mental structures are given form. Although the members of this study group as well as the majority of the conference participants were predisposed to the cognitivist argument, nevertheless the noncognitivist position is no straw man.

The cognitivist-noncognitivist split and the divergent implications for teaching and learning in the arts that result are parts of the problem facing any discipline inserted into a general education framework. Is there or is there not something called a "liberal arts education" with both universal meaning and applicability to all human activity that teaching and learning ought to pursue? Do the arts fit into this kind of education, or do they remain apart? Should the arts be treated as a unique way of knowing separate from but equal to other modes of inquiry because of their uniqueness? Or should the arts be looked at as a part of the general scheme of education, as disciplines that provide one means of giving form and structure to knowledge?

If, as an outgrowth of the cognitivist argument, the arts can exist in the curriculum as part of general education, then does the artistic way of knowing extend to other domains of knowledge and inquiry such as science and mathematics? To pursue this further: If symbol systems can be organized so that the systems are universal, then the structure that emerges for utilization of the symbols in creating, describing, and analyzing works of art becomes the link to other domains of study. The use of semiotics as a structural and cognitive base for the arts would allow for the organization of the curriculum around the symbol system (whether verbal or nonverbal) existing in the art forms and other domains.

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*Members of this group were Harry S. Broudy, Martin Engel, Larry Gross, Vera John-Steiner, Edward Mikel, D. N. Perkins, Brent Wilson, and Marjorie Wilson.

The argument of the noncognitive position as framed by its proponents positions the arts quite differently in the instructional process. Noncognitivists will argue that the arts contain expressive as well as cognitive elements, and they stress that if the arts have any unique cognitive structure, it may pertain to their expressive qualities. They agree it is not reasonable to argue that the arts are not unique in their historical, psychological, or philosophical content as they are similar to other disciplines when studied from these three perspectives. David Ecker of New York University summarized this position in a short working paper he prepared at the conference:

> That the arts can be profitably investigated by relating artistic and aesthetic phenomena to cognitive processes has been amply demonstrated by many participants during the conference. It is also evident that the regulative principles and concepts governing the hypotheses, the kinds of data analyzed, and the conclusions drawn about the arts have come largely from the discipline of cognitive psychology. But we should remind ourselves that the arts—and, indeed, cognitive processes—may be investigated from a number of vantage points. Epistemology, anthropology, sociology, art history, and aesthetics immediately come to mind as modes of inquiry by which often identical or similar phenomena are investigated. And it is interesting that there is a considerable overlap in the vocabularies incorporated in these disciplines; for example, "art," "aesthetic," "symbol," "cognitive process," "perception."

However, the noncognitivist continues, it is the expressive qualities in the painting, the sculpture, the novel, the poem, the play that set it apart. The uniqueness of the arts as a way of knowing, then, may reside in the individual's rationale for solving the artistic problem, in his or her estimate of the worth of the experience, and in the ability of the arts object to reflect the artist's expression. (The expressive content is the cognitive content and it determines the aesthetic worth of the arts object.) The noncognitivist would concede that there are expressive qualities in other areas of study. Nevertheless, the noncognitivist continues, the arts offer the opportunity to produce objects or recreate events that allow for expressive behavior without the risk of having to define a function or purpose other than the enhancement of the individual or the society. So, this argument concludes, looking at the arts cognitively, in the same way as we would mathematics or the sciences, may destroy this unique quality. The argument that the arts are not related to other areas of study because they provide a different ambience, a different set of experiences, and a different mode of inquiry has left arts instruction separate from other curricular areas. The self-protectiveness of arts curricula is linked to the ideas that the artist is separate from society and that the distance artists have created for themselves is very important for and necessary to their role as societal critics and interpreters. Pushed to its logical conclusion, this argument forces the arts into a position outside rather than inside the general education framework.

Developmental Theory and the Arts

The existence of a relationship between developmental theory and the arts was conceded by most if not all of the discussants.* Discussions centered around how far the theories and findings of developmental psychology can be applied to the arts, and around what modifications should be made. Is there a unique mode of artistic development? If so, can it be defined within the traditional assumptions of universal achievement, spontaneity, and sequence of cognitive operations that have guided developmental theory? In addition to assessing the applicability of developmental levels to the arts and aesthetics, there was a desire to relate artistic development to existing developmental theories such as those of Jean Piaget. The overlying questions became: How do the arts relate to the developmental theories that now exist? Are there identifiable stages of growth from which to create a theory of artistic or aesthetic development? Can we define a set of these stages in artistic development precisely enough (from the beginning state to the end state) to fit the traditional developmental theories that by definition require the existence of stages?

The discussants identified a problem they thought likely to develop in the rush to apply to the classroom what developmental theory teaches us about stages of growth: If achievements are truly cognitive-developmental, then they will come naturally in any case, curriculum or no. The group discussion dealt with this problem by proposing an extension of developmental theory that would continue to accept two of its four primary assumptions, and would not so much reject as modify the other two. The two assumptions that would be accepted are sequentiality and hierarchical integration; the two assumptions that would be modified are universality and spontaneousness. The working paper developed by the members of the discussion group explained it this way:

> We propose that there are what we shall call *domains of knowledge* that are developmental to be sure, but which are neither universal nor are they spontaneously achieved. In other words,

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*Members of this group were Terry Baker, Joe Dominic, David Feldman, Howard Gardner, Charles Leonhard, Donald Miller, Wade Robinson, Nancy L. Stein, and Brian Sutton-Smith.

we propose a set of domains which have the qualities of sequence, where there are levels to identify, where movement occurs through these levels, and where there are principles of hierarchical integration that make each level a precursor to and part of the succeeding level. But we propose domains which are not necessarily ones which will be acquired by all children in all cultures, nor are they ones which will be spontaneously achieved independent of the set of environmental circumstances that happened to prevail in a particular culture at a particular moment in time. The label that we give to these domains is *non-universal developmental domains*.

If artistic/aesthetic development is defined finitely by stages meeting these criteria for a developmental theory, then structuring teaching and learning in the classroom becomes a simpler task. It becomes possible to isolate artistic and/or aesthetic development either within each of the art forms or within a broader domain of aesthetic development and then to trace its growth over time. Structuring and sequencing instructional activities within the classroom would be more rational and the age levels at which particular activities would be appropriate would be better defined. Skill levels related to age would also provide guideposts for curricular design. In addition, content selection and the type of inquiry to be conducted in the classroom would be better specified by grade level. Teachers would be able to observe the pace of the child's movement through the curriculum and receive a more accurate picture of student achievement because of better descriptors for evaluation. In short, teachers would have more resources at their command to help them in selecting content, structuring activities, and evaluating progress.

This all seems very possible and productive, yet there was another party in the discussion group which upheld the view that the arts were not applicable to development. Their argument was based on the fact that art is not unidimensional, it requires multiple codes; for example, narrative can be composed of codes for content, grammar, and performance. Art is distinctive because of the interactions between codes. In addition, art expresses subjective states that do not necessarily displace each other developmentally: the feelings the artist expresses are not bound to those of a particular developmental stage. Art is also restricted by two kinds of considerations that have nothing, or very little, to do with development: the genetic inheritance of the artist and the peculiar texture of the medium in which the artist works. Similarly, the artist voluntarily produces art or engages in art-making, and therefore may choose how and to what extent the engagement will take place. The group summed up this argument by saying that insofar as the artist is concerned, the aesthetic process permits artists to express themselves freely, either within or outside developmental dimensions. It is the artist's prerogative as artist to reverse or ignore developmental considerations.

These differences are somewhat similar to the divergence between cognition and expression already discusssed, and they may be considered an extension of the argument. Developmental levels such as those that already exist in drawing and tone recognition can be defined for the arts. The question that remains is their relevance to the artistic process and works of art. Does instruction keyed to developmental levels impede or hinder artistic development? Without a comprehensive schema on which to test the question, present answers are inconclusive.

Perception in Cognition and the Arts

The arts pose the following questions in the area of perception: Is there a perceptual process or way of perceiving that is unique to the arts? Does aesthetic perception exist as an entity in itself? The implications of the arguments over the existence of aesthetic perception extend far beyond the domain of the conference, but a number of interesting points were made there by the group that discussed this topic.*

Susan Chipman of the Learning Division of the National Institute of Education, who was a member of this group, brought out one point of view when she noted, with some qualifications, that there are no cognitive artistic ways of knowing and perceiving. She bases her position on the observation that perceptual knowledge or skill can be acquired and refined through experience with many kinds of stimuli, x-rays as well as paintings. Based on the position he outlines in the paper in this volume, Julian Hochberg would probably support this view of perception.

June King McFee of the University of Oregon was a discussion group member who approached the question in another way. In her view, cognition includes both perceptual and conceptual information-processing, both of which can be expressed in iconic and verbal symbols to communicate between the artist and viewer involved in creating and responding to art. In some of the arts, perceptual information-handling predominates over conceptual information-handling. In some art forms, the information is expressed in iconic or nondiscursive symbols; in others, in written or spoken symbols. The symbols are the medium of communication for the cognitive act.

There seemed to be general agreement among the participants that when perception was considered as either a physiological or psychological process, it is not unrelated to aesthetic perception. Each individual has the capacity to receive and internalize the sense data that are present in the art object or the event or the environment. Giving meaning to that data and analyzing its aesthetic merits or qualities, however, are parts of a perceptual process that must be learned. According to James Gibson, a leading theorist in perception, individuals at birth have all the mechanisms necessary for perceiving their world, and they learn throughout their lifetime to make finer discriminations between the sense data and their meaning.

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*Members of this group were Susan Chipman, David W. Ecker, Kathleen Fitzgerald, John M. Kennedy, Stanley S. Madeja, and June McFee.

Instruction in the arts and participation in arts experiences provide the context in which the refining of discriminations Gibson refers to can happen. The goal in arts education is to provide instruction that allows students to become discriminating about and sensitive to the visual, aural, and kinetic data gathered or received from the arts object/event/environment and to encourage them to analyze this data using aesthetic criteria. Perceiving implies a step beyond sensing: it requires the existence of some cognitive activity concerning the data through which a response will be formulated based on the information received. Determining how the arts are a part of this process and how this can be translated into sound instructional practices is the major task.

The Role of Transfer of Knowledge in the Arts

The fourth area that emerged in discussions at the conference was the role of transfer of knowledge or skills gained in or through the arts to other domains of knowledge.* The following questions were discussed: What are the identifiable transformational processes that link thinking, perceiving, knowing, and expressing in the arts? Are there relationships, similarities, or connections between artistic skills and other kinds of communicative and expressive skills? Are there ways of describing these relationships so that they will have applicability to the instructional process?

Before dealing with the question of transfer, the discussion group distinguished between what was termed an individual's underlying knowledge base and that knowledge he or she could externalize in the form of some symbol system. An individual's underlying strategies for making sense of the world—how he or she selects for attention, aggregates, differentiates, and builds relationships in everyday living—appear to offer a much richer source for knowledge than the information an individual can capture and express in the variety of symbol systems that are available. The major task, then, is how to explicate the role the arts might play in the movement between these two aspects of an individual's mental life. Do the arts enhance the underlying knowledge base of the individual and therefore make it possible to detect and resolve features or relationships that previously went unnoticed? The implication here is that the arts provide a noticeably different way of viewing or knowing the world. If so, participation in the arts can serve to make explicit aspects of events that an individual in fact knew already but could not single out for attention or for future manipulation. This suggests that the arts can be a way of developing a sensitivity to the nuances of events, a senstivity that can be reinforced by studying or actually making a work of art.

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*Members of this group were Jeanne Bamberger, John Cataldo, Virginia Koehler, David R. Olson, Bernard S. Rosenblatt, Anita Silvers, and Ralph A. Smith.

The hypothesis was developed that there are several phases or stages in the process of making this knowledge explicit: first, the initial perception of the phenomenon: recognizing or interpreting it, simply bringing to the surface or to the consciousness distinctions that are hidden in direct action; two, the performance of the particular activity: building the tune, making the drawing, telling the story; and third, the act of making the knowledge explicit in some symbolic form: constructing the formal schema, analyzing the color or shape or the object itself. Consideration of the last stage directed the group into a discussion of whether these categories or schemata should be taught directly or whether they should be left to the child's own "unpacking" of his or her experiences. Application of these hypotheses in the classroom must wait for research on whether or not underlying structures exist, and on whether they should or can be taught for or are better left to the child's own experience.

The question of aesthetic response and how to characterize it was tied into the discussion of transfer; it was also the primary concern of a fifth discussion group.* Can you separate out an aesthetic response, describe the features or qualities that give rise to it, and then teach for it? Or alternatively, is it a case in which what should be taught and learned is a growing awareness of the structural relations and the various levels of structure? If the latter alternative is chosen, then might it not also apply to objects and structures in other domains as well, leading to the possibility of enhancing appreciation of the beauty in other domains and their associated symbol systems? If this is so, then art can truly become a means for extending, organizing, and bringing into consciousness and under control a child's implicit knowledge base.

What remains to be determined is the exact uses of explicit knowledge across the various arts disciplines. Each art form has its own unique qualities as a discipline, and these are sometimes implicit rather than explicit, except as they are manifested in the work itself, and therefore it does not necessarily follow that an individual who becomes a successful participant in one art form will be equally successful in any other of them, or in all of them.

Areas for Further Research

The formulation of a series of research studies around these issues is the logical outcome of the work that was completed at Aspen. The discussions and the papers suggest a number of research topics applicable to instruction in the arts and other curricular domains.

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*Members of this group were T. J. Anderson, Harold Arberg, Mihaly Csikszentmihalyi, A. Graham Down, Howard E. Gruber, Vernon A. Howard, Gil Lazier, Sheila Onuska, Michael J. Parsons, and Fakhri Rahrow.

In the area of artistic or aesthetic development there is a clear need to bring together existing developmental theory and instruction in the arts to formulate some guidelines for arts instruction. The key question is whether current developmental theory is related to the arts and to existing developmental theories in the arts. If so, how can these relationships be described for the purpose of instruction? The research task is to use the data already available on how children approach a wide range of artistic tasks to develop a schema for artistic or aesthetic development. The schema should relate not only to the making of art but to the analysis and criticism of art. Critical noticing as David Perkins describes it should be part of the schema. Connectors to the instruction will emerge from the definition of the developmental schema, and the application of the schema to curriculum. Diagnostic guides to the aesthetic development of students for use by teachers can then be produced and evaluation of the schema can then take place through a systematic validation process in classroom settings. If this can be accomplished in a systematic way, the relationship between artistic development and cognitive development will be clearer.

Resolution of the issue of how the expressive qualities of the arts relate to the arts as a cognitive process poses another major task for research. The cognitive mapping of the domain of the arts is a significant first step in this effort. This will require operations at two levels: the theoretical, which will result in a structure or epistemology compatible with the knowledge base; and the descriptive, which will have direct application to the teaching of the arts. The identification of categories, the definition of the knowledge base in each category, the sequencing or ordering of the knowledge, and the organization of subcategories would be the major tasks. This mapping will require defining and testing the relationships between the knowledge base that exists in the arts (the cognitive position) and the expressive qualities in the arts (the noncognitive position). A result of this effort will be a clearer statement, if not a resolution, of the cognitive-noncognitive dichotomy.

In the area of transfer, the degree to which the process of making underlying strategies explicit in a symbol system influences the individual's learning capacity in other domains should be tested. It seems most probable that some transfer occurs when there are commonalities in the symbol systems themselves, as for example when both deal with explicit spatial relationships. The term "schemata" was proposed as a convenient way of referring to the fundamental or constitutive cognitive structures. It was suggested that cognitive skills transfer from one medium or discipline to another when there is an overlapping or sharing of schemata. Research is necessary to identify and characterize the functioning of these schemata. Part of this research enterprise will involve clarifying what various researchers from different disciplines mean when they talk about schemata. It is also important to discover how these schemata may relate to each other. How do their different presentational modes or media affect the usefulness of the various types of schemata?

An extremely important element of cognition is recognition, which is of paramount importance in aesthetic creating, in aesthetic appreciating, and in instruction, both aesthetic and nonaesthetic. We need to know more about how what the creator is trying to express interacts with the expressive objects he or she makes. We should find out what is involved for the perceiver in recognizing the expressiveness of the object and in recognizing what the object expresses. Finally, we do not want to isolate or lose sight of the phenomenon we call aesthetic valuing. We should examine what children do naturally in producing and enjoying art as well as what teachers expect them to do. Narrowing the gap between the child's natural expression and the teacher's expectation constitutes a fruitful area for research that is likely to improve pedagogy.

The perception area suggests a number of studies centering on the linkages between general perception, cognition, and aesthetic perception and meaning. There are still researchable problems here which need either solution or the generation of data to support existing solutions. The research problems can be characterized in the following series of questions: To what degree does the ability to perceive aesthetically contribute to appreciating and experiencing the work of art? What does the process of experiencing the arts (either by direct participation or by observation) contribute to other ways of knowing and perceiving? If we accept aesthetic perception as a learning process, can it contribute to a fuller perception of all phenomena? Can the present descriptions or data on aesthetic perception suffice as the basis for the teaching and learning of aesthetic perception?

Future research in aesthetic perception should also focus on explicating how teachers can better understand the different cognitive modes that students have already developed so that appropriate learning situations can be provided for each individual child. The following series of research questions indicates the range of possible investigations in just the area of visual communication: Are there individual differences in children's strategies for sorting and organizing visual elements to create more order or variety? In terms of other measures of conceptual and perceptual development, which children make the most varied or most ordered designs when asked to *talk about* and make, or too *look for* and make designs? How do children's manipulative responses relate to their descriptions of how their designs make them feel?

The papers published in this yearbook were commissioned to investigate how the arts are related to cognition and to the basic skills. These introductory remarks attempt to provide some possible answers to the question of how the arts and aesthetics serve as carriers and enhancers of meaning and to draw out the implications of those answers for arts education.

"The Arts, Cognition, and Basic Skills" could not be a more timely topic in education. The schools face the dilemma of education for "minimal competencies." Perhaps it is fairer to characterize this dilemma as a challenge to the schools to provide each student with the elements of a functional literacy that will meet his or her immediate needs and those of society in the next century. Schools today find themselves awkwardly placed between the flood of knowledge and the multitude of means to acquire it, and the unyielding need to impart at least a minimal competency in a number of cognitive areas to the entire population. On the one hand, there is the information overload; on the other, compulsory literacy, if not universal education. And yet, what is literacy? We would surely say it has a wider meaning than its usual application of reading, writing, and computation, and the arts may provide that broader context.

Harry S. Broudy

On Cognition and Emotion in the Arts

At the first meeting of the group planning this conference, I was struck by the degree to which it was taken for granted that in the arts the dichotomy between cognition and emotion or feeling is no longer an issue. This is not a surprising state of mind for a group of cognitive psychologists, but it occurred to me that the dichotomy has had a long and durable history and that perhaps the assumption of its demise may be premature. As recently as 1929, Sergei Eisenstein proclaimed that the "forward movement of our epoch in art must blow up the Chinese Wall that stands between . . . the language of logic and the language of images." With the help of Professor Goodman and our cognitive psychologists the wall has been breached, but has it been blown up or has it been reduced to a permeable membrane? I suggested that some discussion of the background of the issue might be a useful prelude to this conference. The committee asked me to perform it, but briefly and informally. I am responding to this request for brevity and informality by presenting a short paper that makes no claim to scholarship, fully confident that other papers on this topic will not suffer from these deficiencies.

The dichotomy in question is really a double hernia. One is the traditional distinction between reason or intellect on the one hand and the emotions or the passions on the other. The other is the difference between the ordinary or the ordinary philosophical meanings of the cognitive and affective terms and their technical meanings in aesthetic discourse. Both dichotomies are manifest the moment one tries to explicate Cicero's definition of the purpose of rhetoric, and presumably the other arts, namely, to inform, please, move. Can one inform without pleasing and move without either pleasing or informing? Do philosophers, aestheticians, art critics, and psychologists answer these queries in the same or different ways? Do "inform," "please," "move" have the same definition when used by them?

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Implicit in these distinctions is a differentiation of the functions of the soul into appetite, spirit, and reason, which is at least as old as Plato and posited in the writings of many philosophers thereafter. For philosophers the trick was to *explain* the facts of interaction of mind and body, reason and emotion—nobody doubted the facts—after stipulating by definition that their concepts were mutually exclusive. Creation or discovery of problems that can neither be solved nor left alone is the peculiar genius of philosophy that guarantees steady employment for the guild of philosophers.

Nevertheless, the Platonic distinctions are not wholly arbitrary or capricious *entia rationis*. Reason or intellect yields propositions that are related by logical rules, deductive or inductive, and can be tested by these rules. The emotions, on the other hand, are not so related, although they may be "reasonable" both as being intelligible in the light of a whole complex of circumstances and as being justifiable by reasons. The heart has its reasons, to be sure, but they are not the results, necessarily, of reasoning. The nature of ideal concepts by being clear and distinct ideas, and the logical structure of thought, free them from the existential flow of particulars in space and time out of which they emerged. The emotions, on the contrary, cannot seem to disengage themselves from the body, especially the glands and the autonomic nervous system. Cannon's "wisdom of the body," it may be recalled, had little to do with ratiocination and depended for effectiveness on its independence of conscious deliberation. Finally, having one's reason overcome by pleasure and emotion is the philosopher's traditional occupational hazard; the Stoics especially devoted themselves to warning and guarding against it.

From a phenomenological-epistemological view, emotional and cognitive experience also differ. Thus if I say that I am pleased or angry, or that I am examining the hypothesis of a black hole in galactic physics, I can by introspection distinguish my phenomenological state of being angry from that of thinking about cosmological black holes. Epistemologically, if the truthfulness of these reports were challenged, the evidence for these assertions would be different and the difference would easily be recognizable.

Imagination traditionally has bridged the gap between intellect and the passions. It portrays (at least it is sometimes so claimed) universals as a particular image. Imagination shares the freedom of concepts from the existential flow of actuality and the bodily promptings of the passions. Indeed, logic depends for its strictness in no small part on the ability to imagine highly unlikely exceptions to universal propositions, and clear and distinct ideas are possible only by abstraction, that is, successive attenuation of connotation. Abstraction also asks us to imagine the separation of thoughts from things, and things from words. Artistic imagination was often attributed to divine or at least extra-natural sources and took the form of inspiration for the artist and all sorts of dreams and fantasy for ordinary people.

This synthetic or intermediary character of the imagination in partaking of the cognitive and affective aspects of experience bestows an ambiguous aspect on art and aesthetic experience. This ambiguity (Empson identified seven types) has been characterized as a peculiar sort of illusion, an estrangement of the familiar and a way of making the strange familiar, a characteristic of art and of the aesthetic experience. For example, Immanuel Kant says

> Rhetoric is the art of carrying on a serious business of the understanding as if it were a free play of the imagination; poetry, the art of conducting a free play of the imagination as if it were a serious business of the understanding. . . . Thus the orator on the whole gives less and the poet more than he promises. *(Critique of Judgement,* 51)

A similar ambiguity shimmers around the pleasing and moving characteristics in Cicero's definition of rhetoric. A work of art must please and move but not apparently as straightforward bodily pleasures or emotional responses to danger, tragedy, victory. Thus for Aristotle the pleasure in art comes from the fact that we get pleasure from learning something new, and art provides this learning by its peculiar mode of imitating the real. George Santayana, who held a hard-nosed view about the ultimate irrationality of the subjective preferences that envaluate the world, nevertheless balked at equating aesthetic pleasure with the satisfaction of the appetites. Aesthetic pleasure, he noted, points to an external object and not to the physical organs in which it resides, so that "beauty is pleasure regarded as the quality of a thing," and value in the aesthetic experience is perceived whereas normally it is felt. And what is one to make of Kant's dictum that "that taste is always barbaric which needs a mixture of charms and emotions in order that there may be satisfaction, and still more so if it makes these the measure of its assent." Emotion in art, yes, but "emotion as recollected in tranquillity," as Wordsworth says. And Goodman reminds us that emotion in art becomes cognitive.

Aesthetic theories differ in the relative emphasis they place on informing, pleasing, and moving, as do different art styles; but few, if any, aestheticians would argue that any work of art lacks all three characteristics altogether. There is no time to explore these variations in all three dimensions, but a few remarks on the informing function may not be irrelevant to the theme of the conference.

In what sense does a work of art emit information? In what sense does a work of art send a message? In what sense does it have or convey meaning? Can one be taught to encode or decode such meanings? At what stages of development can this teaching take place most profitably? In what sense does a message emanating from a work of art have truth value, and how can such truth claims be verified? Are questions of this kind to be answered in the manner of science or in the manner of the ordinary man engaged in the practical affairs of everyday life? These are among the topics to be discussed and clarified during the conference in Aspen, if nowhere else.

As with pleasing and moving, so with informing it becomes necessary to equivocate on the meaning of communication, information, and other cognitive processes. The nature of cognition in the aesthetic domain ranges from assimilating it to a language system at one end of the spectrum to ineffable revelation at the other. Somewhere in the middle of the range are the attempts to capture the ambiguities of the aesthetic in the communicative mode of the work of art.

In I. A. Richards' distinction between referential and emotive meaning, art would generally be taken as exemplifying the emotive. Yet while many aestheticians would grant that the origin of aesthetic meaning is subjective in the nontrivial sense of being idiosyncratic, they would insist that the content of the aesthetic perception is a phenomenally or phenomenologically objective set of qualities locatable in the work of art. Some art, to be sure, does yield a straightforward referential meaning by its subject matter or by its use of conventional symbols, but most aestheticians play down the aesthetic value of such information.

Santayana regarded the informational content of the work of art as a perception of objectified value. Clive Bell would hold, I suppose, that if the work gives any information, it is of significant form. Even in the aesthetics of scholasticism, where the art work is characterized as a revelation of truth, the truth is not discursive knowledge but that which is seized in an intuition and then made visible by the artist. Does it take Susanne Langer's "presentational" symbols to accomplish this?

The problem of aesthetics, therefore, is the form that information or knowledge takes when the communicator is a work of art or an artist. That it is not outright propositional knowledge is generally conceded. Thus beautiful calligraphy need tell us nothing of its content or referents, and the elegant sign above a restaurant tells us much about the prices to be charged long before we see the menu. Yet it is generally agreed that works of art do say something, are expressive, and in some sense communicate even as they please and move.

The search for a system of symbols by which this communication can be construed with some degree of intersubjective uniformity is a perennial challenge to aestheticians and psychologists. Structures of language and collective myths and images so pervasive as to constitute a universal context of meaning in the arts are posited to help satisfy the yearning for a "language of the arts" that would ground and explain the community of meaning needed for communication via the arts. Understanding how these structures—if they exist—are developed within the special circumstances of culture, age, and environmental forces is a desideratum for educational psychology in general and for aesthetic education in particular. The group assembled in Aspen, one can be sure, will contribute to researches of this kind.

Yet, as W. K. Estes, editor of the *Handbook of Learning and Cognitive Process*, says, "As in other aspects of cognitive psychology having to do with language, we are beginning to appreciate the dangers of devoting too much effort to describing the way in which learning occurs before we know what is learned" (Vol. I, p. 13).

What is to be learned in and from the arts is far from clear because the nature of the aesthetic experience, the aesthetic object, the aesthetic attitude, the work of art is still in controversy. There is little prospect of these issues being settled, not only because philosophers are fond of perennial puzzles, but also perhaps because the strange ambiguity of the aesthetic domain both with respect to its ontology and phylogeny, not to speak of its role in daily life, may be inevitable and not wholly remedial. Accordingly, the concepts of aesthetics must still be regulative for psychological research.

All of which suggests that art, like religion, speaks by what Søren Kierkegaard called indirect communication. Suppose, says Kierkegaard, a guest having been invited to a festive occasion were to answer: "You can count on me, I shall certainly come; but I must make an exception for the contingency that a tile happens to blow down from a roof and kill me; for in that case I cannot come." One could take this to be a jest, but, as Kierkegaard remarks, "it might at the same time also be the highest earnestness; and the speaker, though jesting with me, might exist before God." (*Concluding Unscientific Postscript*, trans. by David F. Swenson and Walter Lowrie, Princeton University Press, 1941, p. 41.) In any event, this dark saying gave the prospective host something to think about, including the advisability of withdrawing the invitation altogether. (For a detailed consideration of this point, see H. S. Broudy, Kierkegaard on Indirect Communication, *The Journal of Philosophy*, 1961, 58(9), 225-233.)

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Martin Engel

An Informal Framework for Cognitive Research in Arts Education*

Since the days of such seminal works in art education theory as those of Dewey, Lowenfeld, and Arnheim, certain philosophical and psychological positions have tended to dominate the thinking of educators. Predominant notions about what arts education is and should be have created a theoretical diversity among colleges of education. Nonetheless, a common feature of such diversity is the notion of "art and experience." Such a conceptualization invariably produced teacher education curricula that stress primarily affective teaching and learning processes. The lack of sound theory about the arts as unique combinations of mental skills makes significant change in education curricula virtually impossible. Thus Arnheim's contrary notion that perception is cognitive—is "visual thinking"—continues to be subordinated to the creative, developmental, and experiential concept of the arts as instinctive, ineffable processes.

The creative and developmental theories of Lowenfeld have only recently become subject to a basic reconceptualization that allows for the strong possibility that the arts are distinctly cognitive, that is, the consequence of mental activity that might even be analogous to logical, semantic thought. The implications a verification of such conjecture would have for the arts in education are considerable. While research into cognitive processes abounds, it must be stated at the beginning of this exploration that there is as yet very little empirical research supporting what is no more than an assumption in this paper: that the arts are the consequence of such cognitive processes. Even a cursory overview of the research in cognitive theory, however, suggests a fertile area of investigation. The dimensions of that investigation constitute the point of this discussion.

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*This paper is based on a background paper prepared by the author for the planning meeting for the Aspen Conference. An adaptation titled "Research and Development: Arts in Education" was published by the author in *Art Education*, November 1977.

One of the reasons for the disarray of the arts education field is the lack of an adequate theory base for instruction in the arts. Tradition, the enhancement of the quality of life, self-development, facilitation of academic performance in basic skills, recreation, and similar "affective" reasons are offered, usually unconvincingly, to administrators. The curriculum itself also follows such justifications and thereby fails to teach, lacks rigor, abjures the hardship of discipline and work, and trivializes the arts in the schools. Nevertheless, the forces of advocacy for the arts in education have become increasingly vocal.

On the one hand is the position espousing the normative and the ideal: "The arts are important and ought to be a central part of the curriculum." On the other hand is the voice of the descriptive and the real: "The arts are merely an enrichment and a luxury that can be eliminated from the school program." Unfortunately, both positions are correct, but for the wrong reasons. Neither the arts education advocates nor the budget-cutting administrators provide a rational basis for their position. For the purposes of education, then, the arts are either their own justification (which is to say they require no justification beyond the claim that art is intrinsically valuable and important), or the arts in education are the helping means to non-artistic ends. What is missing in both the justifying argument and the claim that no justification is possible or necessary is the possibility that the arts are no less than anything else now deemed central to the curriculum of the school, that is, they are languages of comprehension, of thinking, of knowing, of receiving, and of expressing information. Stating this position baldly: the arts, like other disciplines in the schools, are basically about knowledge.

Educational and psychological research in areas such as language acquisition and perception has proceeded apace, but research in the cognitive significance of the arts has languished. We are discovering other important aspects of learning which, although not presently included in the conventional domains of literacy and mathematics, are nonetheless highly significant in the growth and development of the mind and its functioning. We are beginning to discover the relevance to all knowledge of the competencies that are usually associated with the arts and humanities and the ways in which they are learned and taught.

Schools are charged with educating the nation's young in the skills of reading, writing, and mathematical computation; in short, the skills of languaging and logical, symbolic thinking. In that context, it is not an unduly stretched metaphor to view the arts as basic languages that communicate and that are part and parcel of the human capacity to mentate, that is, to think and know. Whether the skills of symbolic processes assume the form of propositional verbal statements or of iconic images, whether they require a capacity to solve an algebraic word-problem or to discern and comprehend the logic of melodic construction—in any case they demand the development of a broad array of cognitive skills in the young person and, it is conjectured, these various skills enjoy extensive interrelationships.

Once it is admitted that it is at least possible for visual and aural literacy or communication to be of equal importance with print decoding and comprehension, and that they are interactive in the human mind, it is no longer acceptable to view the exclusivity of print reading instruction as anything but myopic and intellectually naive. At the very least, it is essential to recognize the inexorable linkage between literacy and literature, the "deep structures" of language and music, the cadences of sentences and melodic development, the uses of both verbal and visual metaphor, the images, icons, and the rhythms of meaning that are contained in the very nature of symbolic forms and our capacity to learn them, understand them, and express them.

Considerable progress has been made in research in a number of fields applicable to the arts in education. Our understanding of the mind and its functioning has been significantly enhanced by various psychological, sociological, anthropological, and linguistic studies, and by perceptual, cognitive, social, developmental, statistical, and clinical research. In 1973, Patrick Suppes suggested a four-part division of cognitive research: behavioral models, exemplified by the theories of Skinner and Estes; developmental models, represented by Piaget; linguistic modes, per Chomsky; and the information-processing paradigm of Newell and Simon. The implication is that these four modes hover on the brink of integration.

The significance of cognitive research is suggested by Perkins (1977) in the introduction to *The Arts and Cognition*, where he refers to

> the fertile research in cognitive psychology which has recently illuminated such complex human performances as language, problem solving, memory storage and retrieval, perceptual discrimination, and learning. Cognition, or "knowing," is too easily construed as solely a matter of words and their silent manipulation. But recent work in cognitive psychology emphasizes that such nondiscursive matters as perception, motor control, personality, and emotion may be embraced within this approach.

The cognitive intellectual framework for a theory of art education that is based on the theories of semiotics, structuralism, and cognitive psychology must incorporate some of the assumptions discussed in the rest of this paper. Scholes (1974) in *Structuralism in Literature* defines structuralism as an intellectual system, calling it "a complete, self-regulating entity that adapts to new conditions by transforming its features while retaining its systematic structure." Thus the world has a structure, and the individual mind, as it thinks and knows the world, structures. What it structures are schema or schemata. The collective mind shares, and thereby incorporates, the universal commoness of individual structures. They are intersubjective and can constitute what we call "knowledge." Furthermore, there is a presumed congruence, if not a causal connection, between the endogenous structures of the mind and the exogenous structures of the world.

Languages, as received, learned, processed, and generated, are symbolic codes and part of, or sub-structures of, the internal representation of the inter-subjective structure, that is, part of the mental structures that we all share. That is why languages communicate. These languages take many forms, including myth, science, art, mathematics, and discursive prose. The study of the structure of verbal discourse—language—is linguistics. There is not yet a parallel discipline that systematically studies the structures of nonverbal modes of discourse—nonlinguistic symbolic codes. Cognition is the mental activity of creating, perceiving, using, and enhancing—that is, learning—these structures.

The arts are a form of knowledge, a symbolic and expressive system or structure. Whether painting, sculpture, music, dance, theatre, literature, film, industrial design, architecture, or any other form of aesthetic endeavor, the activity takes place within the form of a symbolic structure-set which both is and contains knowledge. The arts can therefore be understood as cognitive processes. The human organism in the process of conceiving, knowing, perceiving, feeling, and valuing—in short, when thinking about reality, both imagined and actual—encodes, constructs, or maps via a number of modes of discourse whereby it externalizes the configuration of these thoughts as the schema expressive of the structure of the mind.

Human beings are symbol makers. The question is, How do they learn to become symbol makers? How do they learn to understand symbolic forms? Having become symbol users, that is, information processors, how do they add new knowledge, or, to pose the question another way, what is the process whereby the incoming signal carried by a stimulus is transformed to become congruent with an appropriate central neural control pattern? The stimulus can be autonomously generated as well as externally induced. As if with prescience, Charles Baudelaire in the 1850s wrote a poem entitled "*Correspondences.*" In it, he says:

> Man passes through a forest of symbols
> Which observe him with familiar glances.

What are the processes whereby the equilibrium of the structure of the mind is cast into disequilibrium and then restored as the new experience is assimilated, achieving a correspondence? How does a new phenomenon, an insight, vision, or idea, permeate and alter the existing structure so that everything we know is changed by whatever we learn that is new? What happens when we create, invent, learn, and express?

Clearly there is a strong possibility that learning about the arts is a process similar to, if not the same as, learning the basic linguistic mode of discourse that now dominates education. Language comprehension, aural/oral transmission and receiving, decoding sound and print, and the transformation from "utterance to text" as Olson puts it, all suggest a line of research that can be immensely useful in understanding the arts within the context of the learning experience.

While much more research has been conducted in the area of language and its utilization than in other forms of human communication, the state of the art is crude, and reliable information scant. It is likely that research, particularly cognitive research, can bear out the proposition suggested above: that is, that the cognitive processes of the mind that generate language and its use are comparable to those mental activities that generate the arts, their meaning, and use, and indeed, may be expressions of some generic cognitive processes.

Such research should focus upon issues pertaining to metaphor: figurative languages; the transformational processes of intuition into formalized codes and how such skills are learned; literacies such as the visual, dramatic, kinesthetic and musical; and other dimensions of the acquisition/creation and production of internal representations and their creative transformation (mapping) into the formal, symbolic codes that we call the arts. In such terms, the arts are basic skills, no different from the reading comprehension skills that also call for the ability to aggregate, discriminate, conserve, structure, and restructure patterns, relationships, and configurations.

Scholes, for example, identifies the meaning—the message in the symbolic form—as emerging not only from the syntactic/grammatic layers of meaning, but from deeper, semantic elements as well:

> I am suggesting that the visible signs of literature are to be found at least as frequently in this multiplicity of the nonverbal elements of communication as they are in any special qualities in the grammar and syntax of the message itself. And furthermore, that this duplicity often manifests itself in the message in the form of irony, paradox, and other devices. . . . This duplicity, which is a kind of playfulness, is at the root of any purely aesthetic experiences that literature may bring us. (Scholes, 1966/1976, p. 26)

What, then, does all this have to do with research in the arts and in education? What is the point of the connection—the nexus—wherein theories of cognition, of symbolism, and of structuralism, insofar as they illuminate our understanding of art, bear upon how we learn and therefore how we ought to be taught about art? When stated as a series of questions, the linkages between the arts, learning, research, and education compel serious and fundamental inquiry: What are the connections between language and other modes of discourse? If there are significant similarities, can we learn anything from the ways that languages are learned and taught that bears upon learning about the arts and learning to make art? Is there such a thing as transfer: that is, does enhanced skill in one mode of discourse pervade the cognitive competence of the individual generally or does it remain a local acquisition? Are there underlying ideational elements in the various modes of discourse—such as metaphor, balance, and symmetry, or, as Scholes would have it, irony and paradox—that, if taught, move us all closer to an understanding and appreciation of all modes of symbolic form? Does the notion of comprehension (as in reading comprehension and functional literacy) have any relevance to an understanding of learning in the arts? Is there such a thing as art comprehension or, breaking it down further, music comprehension, visual art comprehension, dance comprehension, and so on? And is such conjectural comprehension in the arts analogous to the more extensively developed theories of reading comprehension? Is there such a thing as "functional literacy" in visual literacy or musical literacy? If so, how would such a literacy be conceived: as a developmental model, a skills hierarchy, a form of information processing, or something else?

Assuming the foundations of cognitive research, how can research in the arts be informed and enhanced by the knowledge generated in those disciplines analogous to the arts? How does the cognitive structure develop as a symbolic process, and why does expressiveness develop in one symbolic form but not another? Are there similarities and relationships among symbolic forms, and what are the outcomes of such symbolic ends when attained by cognitive means? What are the linkages between the verbal and the iconic? On what basis are expressive symbolic systems differentiated?

Having posited one eclectic intellectual model, we must now more modestly ask if any single intellectual theory of learning, of art, or of the imagination can serve as an umbrella, an all-embracing cover, beneath which the highly synthetic amalgam of activities that we call learning and education in the arts can be investigated and explained.

These questions do not by any means exhaust the field of research in the arts. They are meant to suggest some possible directions just as the discussion of the cognitive/structuralist model was intended to provide one possible intellectual framework within which research has been and will continue to be conducted.

In the pages of the *International Encyclopaedia of the Social Sciences* (Vol. 2), it is argued that: "Language is employed in many, but by no means all, cognitive processes; there are, for instance, forms of thought in music, painting, and certain of the performing arts that are not linguistic." Robert Shaw (1976) makes the point: "Let us recognize the fact that much of our knowledge is either tacit or purely nonverbal, neither being able to assume a linguistic form. . . . Learning to read is of course an indispensable social skill but so is learning to 'see' in the broadest sense of the term." Monroe Beardsley (1971) argues for the intellective dimensions of the arts, pointing to both Rudolph Arnheim and Nelson Goodman as major theorists and advocates for the arts as cognition: "We will have to take more account, at certain stages of instruction in the arts, of the cognitive elements of art creation; and we will have to recognize the role of the cognitive in art appreciation."

It should be pointed out that there is no one unified theory of cognition upon which education theorists can build a theory of learning and instruction. Instead, there are a number of research areas that can be called cognitive by stretching that term to its limits of meaning to incorporate all mental activity or mentation. Thus we may include the perception theory school, the semiotic or symbolic school, the artificial intelligence and information-processing theorists, many of the empirical and scientific aestheticians, the linguists, and the Piagetian developmentalists as well as those other theorists and researchers concerned with the creation or development of mental structures. While in most instances their work does not place the arts at the center of their investigations, their work clearly has significant implications for the study of the arts in terms of systematic and rational activities and suggests logical connections among other terms like creativity, learning, problem solving, imagination, arting, appreciation, thinking, knowing, and development. The implications for the arts are highly significant. While the arts continue to be expressive, intuitive, and affective, they need not be incomprehensible and mysterious. If the arts are fundamental to all human beings and their mental activities, the need for greater understanding of those activities is an apparent first step to the facilitation, or enhanced facilitation, of the acquisition of artistic interest, competence, and use.

As further summary of and justification for the research activities advocated in these pages, it would be well to include a number of comments on related topics. Stuart Hampshire in "The Future of Knowledge," an essay published in the *New York Review of Books*, asks: "Should we investigate the possibility of an empirical theory of knowledge, itself founded on planned research?" He goes on to refine his concern with the following caveat: "I am speaking only of the acquisition of knowledge by scientific and scholarly research, and of its subsequent availability; I am not speaking of the uses of knowledge in education." Thus, Hampshire restricts his interest to basic, as distinct from applied, research. The logic for such exclusivity is neither mere snobbishness nor scientific elitism. It can be argued that education—that is, a technology of instruction—must be predicated upon a theory of instruction—or should we say, an adequate theory of instruction—in order to elevate the practice above the level of trial and error. One may further contend that in order to obtain an adequate theory of instruction, there must first exist a theory of learning that, in turn, must be built upon a theory of knowledge—an epistemology—with an empirical and operational foundation.

Hampshire, seeking an overview of research in the sciences, suggests the directions that have been assumed by the cognitive theorists for some time: "Scholarly and scientific inquiry is turning inward toward the mechanisms of the knower's mind, and therefore to the nature of knowledge itself, as a possible object of direct inquiry, no longer of mere speculation." Because the arts, along with the sciences, represent a major segment of the reality that mankind knows, they are appropriate fields for the kind of disciplined inquiry that can lead to a more comprehensive and adequate theory of knowledge.

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Anita Silvers

Show and Tell: The Arts, Cognition, and Basic Modes of Referring

> *This was the conclusion at which I was seeking to arrive when I said that painting or drawing, and imitation in general, are engaged upon productions which are far removed from truth, and also the companions and friends and associates of a principle within us which is equally removed from reason, and that they have no true and healthy aim. (Plato, Republic, translated by Benjamin Jowett, Book X, 603b.)*

> *The Arts are fundamental modes of human understanding and a way of knowing what the world is about; that is, a body of knowledge and a system of symbols, like science. (A Statement by the Arts and Humanities Advisor to the Institute, National Institute of Education/DHEW, for the White House Meeting on Education and the Arts, September 8, 1976.)*

> *Can the imagined world of the storyteller inform us about the real world of experience? That question has become the controversy of the day. (From a recent advertisement run by Harvard University Press.)*

The Pitfalls and the Pendulum

The controversy of the day also has been the controversy of many other days. Indeed, the swing between cognitivist and anticognitivist accounts of art describes one of the traditional pendulum arcs of aesthetic theorizing. The pendulum now appears to be moving inexorably toward the cognitivist extreme, as witness the latter two citations above, but not very long ago anticognitivism was the order of the day. It was less than twenty-five years ago that Anglo-American philosophical aestheticians heeded Arnold Isenberg's (1973, p. 103) exhortation "to sweep the field clean of the traces of cognition."

"Epistemology and the psychology of belief furnish poor *models* for use in aesthetics, for these models do not yield principles and details which prove applicable to aesthetic inquiry," Isenberg complains (p. 104). In this paper, I propose to examine some of the grounds that

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generated recent anticognitivist suspicions of epistemological approaches to aesthetics. The point of the investigation is to grasp firmly the concerns that inform anticognitivism and to sketch some responses that seem available to those who are designing the newest versions of the cognitivist position.

The importance of this enterprise extends beyond the boundaries of philosophical aesthetics. All empirical research occurs within contexts constituted by theoretical presuppositions. If these presuppositions are not carefully formulated and defensible, the initial success of the research is likely to be overwhelmed by defects in the theoretical framework.

The history of attempts to provide a cognitivist framework for accounts of aesthetic appreciation indicates the dangers. There are, of course, phenomena associated with aesthetic appreciation that encourage the cognitivist approach. We do find ourselves engaging in apparently intelligible talk about learning from or about understanding or about grasping what is signified by art objects.

Nevertheless, serious attempts to treat the arts as fundamental modes of human understanding have foundered in the past because they rested on inadequate views about what cognition involves. Typically, these attempts assimilated cognition as it occurs in aesthetic appreciation to cognitive models whose primary locus is in another domain. Adopting a cognitive model from a primarily nonaesthetic domain results in assuming the views about the purpose of cognition, and therefore the cognitive criteria, that are appropriate to that particular domain.

To make such assumptions about aesthetic cognition is to court disaster. This is not to say that our theories about cognition in the aesthetic context must be completely disassociated from our general account of cognition. Indeed, to detach aesthetic knowing totally from knowing as it occurs in other domains creates problems in explaining how we learn from art objects.

Importing cognitive criteria is equally hazardous. What tends to happen is either that the description of aesthetic experience becomes poverty-stricken because so many of the phenomena that are characteristic of aesthetic experiencing must be ignored, or else it becomes apparent that many of the characteristically aesthetic phenomena interfere with the efficient satisfaction of the imported cognitive criteria.

When these difficulties become manifest, the reaction that typically sets in is the adoption of theories on which the relation between aesthetic experiencer and aesthetic object is taken to be emotive rather than cognitive. If research into the cognitive dimension of aesthetic experience is to be productive, it would be well to avoid the pitfalls of the past and to develop models for aesthetic cognition that are compatible with the full range of phenomena exhibited in our creation and appreciation of art.

Roadblocks

One fundamental problem for any cognitivist approach to art is to provide an account of how art objects (or their elements), when construed as cognitive devices—that is, as conveyors of significance or meaning or knowledge or information—are correlated with referents. In addressing this point, our recent anticognitivists took the proposition as the paradigmatic cognitive device and took ostention as the paradigmatic operation for teaching the meaning of symbols. (See Nagel, 1943, and Price, 1953, for versions of this argument.)

For a basic cognitive device to be useful, they assumed, it must be possible to present both it and its referent to learners in such a way that the correlation is established. Once the correlation is learned, the cognitive device can be used effectively to refer. Given this view of how the meaning of cognitive devices is established, reiteration is a requirement for efficient referring. Once we learn that the word *red* refers to the color red, it is efficient to reiterate the word in order to repeat reference to the color. It would be inefficient to introduce a new word or symbol whenever reference to the color red was desired, since the new word or symbol would be meaningless unless some further correlating operation occurred.

If reiteration is a condition of the efficient functioning of cognitive devices, then art objects do not seem to be good candidates for the efficient conveying of meaning. Reiteration is not considered to be a desideratum in art. With the exception of certain highly conventionalized elements (for instance, the halo or the cross or the Pieta arrangement in religious paintings), we do not isolate the constituents of art objects, correlate them with referents, and expect that they will carry the same meaning when they occur in other art objects. (Reiteration should not be confused with the repetition of refrains or themes in a single work or in a style.) Take the device of elongating the human figure. We do not expect our account of the significance of this device in El Greco's paintings to establish a correlation that serves to determine the significance of the elongated human figures in paintings by Modigliani.

There seem to be at least two reasons for the rejection of reiteration in the aesthetic context. First, it seems as if the significance of each of an art object's constituents is affected by all the other features of the work. This is the extreme of context dependence. It is plausible to contend that the constituents of aesthetic objects—the single note or the patch of blue, the lone Pollack splatter or even one of Mona Lisa's eyes—carry no significance in isolation. In contrast, the word *red* preserves its basic meaning in isolation from the sentences in which it is employed.

We are reluctant to allow *a priori* that the addition or subtraction of any feature of an art work will leave the significance of the other features untouched. Thus, if reiteration of an element is to repeat securing the element's original referent, the entire context apparently would have to be repeated. But to repeat the context is to reiterate the entire art object, and this brings us to our second point.

Aesthetically indiscernible objects typically count as instances of the same work. (For further explication of this point, see Meager, 1958-59.) Works that are overwhelmingly repetitive are castigated as copies or as derivative art. It is true that those who are not practiced in appreciating art seem to be comfortable with familiar types of objects. Should you have any doubt about this, check the selection of pictures stocked by Woolworth's or Sears'. But there seems to be general agreement that derivative works, in addition to whatever other defects they may display, do not have significant cognitive import.

At least in the Western tradition of art, innovation enhances import. And even if, in other traditions, art is more static and can be more comfortably approximated to the linguistic or propositional model, we still must deal with the phenomena generated by Western art. A cognitive model that is useful in understanding both Western and non-Western art is preferable to one that fits only non-Western or, for that matter, only Western art.

Believing that repetition is required for efficiency in the operation of cognitive devices, and noticing that repetition does not constitute a virtue in art, the anticognitivists concluded that art objects cannot be very effective cognitive devices. The underlying reason for their conclusion is clear.

If understanding what cognitive devices convey occurs as the recent anticognitivists assume it does, then, in order to understand each new art object we encounter, we would have to engage in a new or additional learning process. It would be as if, every time we encountered a new sentence in our native language, we had to learn the meaning of the sentence before we understood what the sentence meant. Thus it is the pedagogical predicament that contributes momentum to the anticognitivist swing.

Pedagogical considerations also underlie another recent version of anticognitivism. This is the position generated by the claim that it is impossible to paraphrase art. The argument is most extensively developed in the context of literary criticism by representatives of the New Critics (Brooks, 1947). I mention it here to indicate that anticognitivism is embraced not only by some philosophers but also by some of those who are most directly involved in enhancing aesthetic appreciation.

What evidence is there that it is impossible to paraphrase art? The phenomena exhibited in support of this claim all seem to show that, no matter how much is said about the meaning of a poem or of any other art object, the object's meaning cannot be totally exhausted by the paraphrase.

Cleanth Brooks tells us that his paraphrases are at best approximations of their poetic objects. Brooks' conclusion is that we cannot say satisfactorily what any poem means, and it is a short step from this conclusion to the conviction that we cannot know what any poem means. After all, how can we teach anyone else what an art object means if we cannot say what it means, if no interpretation totally captures the object's meaning, and if apparently incompatible interpretations often appear to enjoy equally convincing grounding in the work?

If we admit that we cannot say what any art object means, then how can we expect our students to demonstrate the accuracy of their understandings of the objects? Considerations of this sort lead to treating art objects as stimuli of emotional responses rather than as conveyors of meaning. Thus Plato and his modern followers are found describing aesthetic experience as generated by "a principle within us which is . . . removed from reason."

Roadsigns

The resurgence of cognitivism in contemporary American philosophical aesthetics can be traced to the publication of Nelson Goodman's *Languages of Art* in 1968. In that work, Goodman (p. 262) says, ". . . aesthetic experience is cognitive experience distinguished by the dominance of certain symbol characteristics and judged by standards of cognitive efficacy. . . ." The identification of aesthetic experience as fundamentally cognitive is a clear violation of Isenberg's dictum. Since Goodman is a paradigmatic cognitivist, we might expect his account of art to diverge significantly from the accounts produced by the anticognitivists. Therefore it is noteworthy to observe that Goodman's account of art is actually compatible with that given by the anticognitivists, while his conclusions about the cognitive function of art diverge sharply from the anticognitivist position.

On Goodman's account, the aesthetic is characterized by certain symptoms. Three of these symptoms are characteristics that Goodman (1968, p. 252) calls syntactic density, semantic density, and syntactic repleteness. These aesthetic characteristics deserve some further discussion for they generate the phenomena which—the anticognitivists insist—prevent art from functioning cognitively.

Combining Goodman's terminology with the locutions I have been using, we may say that one cognitive device is more replete than another if, roughly, a greater variety of its features is relevant to its conveying its meaning. For instance, given the conventions of ordinary mapmaking, we can rule out *a priori* that the texture of the paper used for a AAA road map is relevant to the map's meaning. But we cannot rule out, at least *a priori*, that the texture of the paper used for an artist's rendition of a AAA road map—let us say, a work entitled *Road To Heart's Desire* as opposed to a map called *Streets of San Francisco*—is relevant to the rendition's meaning. Perhaps the rough texture of the paper that the artist has used conveys the bumpiness of the journey to which *Road To Heart's Desire* refers.

Other things being equal, the artist's rendition is more replete than the road map because texture of paper is an additional possible determinant of meaning. A thoroughly replete cognitive device would be one whose every feature was involved in determining the device's meaning. Repleteness, then, is another name for the characteristic that we called context dependence in our explication of anticognitivism. In this respect, Goodman does not disagree with the anticognitivists in his account of art, and his analysis provides an explanation of one of the phenomena to which the anticognitivists appeal.

According to Goodman, a scheme is syntactically dense if it provides for infinitely many characters so ordered that between each two there is a third. In general, density produces difficulties in determining what characters are displayed and also in determining what the referents of identified characters are. Density generates a profusion of characters and a profusion of referents.

Any symbol system possessing a profusion of characters is one in which reiteration is discouraged. That is, if a scheme provides for infinitely many characters, the scheme seems designed to elicit variation rather than reiteration of characters. In identifying syntactic density as a symptom of the aesthetic, Goodman seems to have constructed an explanation for the rarity of reiteration in art and thus to have created an account that is compatible with the anticognitivists' position.

What about the impossibility of paraphrase? Suppose one attempted to translate from a semantically dense system to a semantically differentiated one? On Goodman's account, this would be the case if one were trying to paraphrase an art object in ordinary English. Presumably, no matter how much is said in the semantically differentiated system, the meaning of the semantically dense original would not be exhausted, since the semantically differentiated system cannot match the semantically dense system in respect to profusion of referents.

The presence of semantic density as a characteristic of art objects thus provides an explanation of why paraphrase is impossible, or at least of the phenomena to which Brooks appeals in insisting that paraphrase is impossible. Once again, whatever distinguished Goodman's approach from that of the anticognitivists does not seem to lie in his characterization of art as relatively replete, syntactically dense, and semantically dense.

Let us recall now that the fundamental anticognitivist complaint appeared to be generated by pedagogical concerns. In this spirit, anticognitivists presumably would deny that replete and dense cognitive objects can function effectively. Goodman (1968, p. 253) remarks that syntactic density, semantic density, and syntactic repleteness

> call for maximum sensitivity of discrimination. Syntactic and semantic density demand endless attention to determining character and referent, given any mark of the system; and relative syntactic repleteness in a syntactically dense system demands such effort at discrimination along, so to speak, more dimensions.

We may expect the anticognitivists to reply that, even with maximum sensitivity of discrimination, the indeterminacy of dense and replete cognitive devices precludes their being cognitively efficacious. In order to meet this objection, we must show that it is possible to learn to understand dense and replete cognitive devices, and we must also argue that such devices are suited to serve at least some of our cognitive purposes successfully.

In developing his theory of aesthetic meaning, Goodman distinguishes two modes of referring—denotation and exemplification. Propositional expressions refer by denoting. Roughly, they can be thought of as labels that refer to things. Goodman suggests that a symptom of artistic expressions is that they refer by exemplifying. Roughly, this means that they are things that refer to labels. Goodman's proposal that art objects signify by functioning as examples has not been as thoroughly explored as some other parts of his work. In what follows, I will attempt to expand on this analysis of how art objects refer in order to show that we can defuse the anticognitivist fears about the cognitive efficacy of art by construing aesthetic reference as exemplification rather than as denotation. (For a further discussion of treating art objects as examples, see Silvers, 1975.)

Showing is an effective mode of telling. Understanding cognitive devices that function by showing—that is, that refer by exemplification—is a basic cognitive process. If you want to teach a child to make a bed, or to weed a garden, or to iron clothes, showing the child how to engage in these activities is usually more efficient than describing how to engage in them.

The effectiveness of showing in these contexts should not be attributed to limitations in the cognitive abilities of children. Consider for a moment how difficult it would be for you to write out an adequate set of instructions to guide an uninitiated adult in learning how to do any one of these activities.

If you know how to cook, imagine how you could construct a written guide for preparing your favorite dish that would be effective in instructing someone who had no notion of what to do in a kitchen. You could not say "Use one tablespoon of sugar!" You would have to write out instructions about using the measuring spoon and identifying the sugar. You could not say, "Bring to a boil!" You would have to describe how substances are brought to a boil, as well as how to recognize a boil when one occurs. In such a situation, showing is more efficient than telling. It is more efficient to show what the sugar looks like and how not to confuse it with the flour or salt. Thus, there are contexts in which cognitive purposes are better served by exemplification than by denotation. And what we should notice is that children, as well as adults, appear capable of learning by example.

As a mode of referring, exemplification is varied and flexible. The range of referential capacities that exemplification enjoys is usually obscured because we tend not to differentiate among different ways of showing. For instance, *Webster's New Collegiate Dictionary* treats *model* and *sample* as if they were synonyms of *example* and therefore synonyms of each other. In fact, there are different types of examples—that is, different ways in which exemplification occurs. Even the three juvenile instructional situations mentioned above are not identical in respect to the way exemplification operates.

To show a child how to make a bed, one should engage in exemplary bedmaking. The sheets should be pulled tight; the corners should be neat. In this instructional situation, one is presenting the child with an exemplar, an ideal toward which to strive.

To show a child how to weed, one should present examples of weeds (as well as examples of the plants under cultivation). These examples function as samples rather than as exemplars. The point of the activity is to pick out all the plants relevantly similar to the example, not merely those most closely resembling the ideal weed. Because of the variation among individual weeds, more than one sample may be required, whereas, in contexts in which exemplary rather than sample examples are used, only the single exemplar is appropriate.

To show a child how to iron, one should allow the child to practice with an iron. An ordinary iron, however, is likely to be too heavy and too dangerous for the neophyte ironer. Therefore one might provide the child with a toy iron, one that is small enough and light enough for the child's hand, one that becomes warm rather than hot. The toy iron is not an ideal example—that is, an exemplary iron—nor is it a typical example—that is, a sample iron. The toy iron is a model of an iron. It incorporates features that are relevant for the instructional process and excludes features of an iron that would interfere with the instructional process.

Goodman (1968, p. 53) tells us that "exemplification is possession plus reference . . . exemplification is the relation between a sample and what it refers to." We should understand that possession generates but does not exhaust reference. That is, not all examples must possess all features of the referents they exemplify. This is one respect in which exemplars, samples, and models are subject to differentiation.

Neither models nor samples possess all the features of their referents, while exemplars must possess all the features of their referents. For instance, the lesson in bedmaking would be less effective if the exemplar of bedmaking omitted any feature one would wish one's student to strive to include in his or her own attempts. On the other hand, no sample weed need include all of the features of its referent. This is why a collection of samples may be preferable to a single sample. Finally, a model cannot include all of the features of its referent, since the point of employing a model is to avoid features of the referent that would interfere with instruction.

Obviously, the cognitive procedures employed to secure the referent of an example will vary depending upon whether the example is taken to function as exemplar, or as sample, or as model. When examples operate as exemplars or as samples, members of their compliance classes should be expected *not* to possess all of the signifying features of the examples. In contrast, the members of a model's compliance class should be expected to possess all of the signifying features of the example. Thus an example might qualify as a satisfactory model but as a very poor exemplar.

In one of his discussions of exemplification, Goodman (1977, p. 15) creates a heroine, Mrs. Mary Tricias, who presents a tailor's swatch to her draper and orders cloth "Just like this!" She receives several hundred two-by-three inch pieces of cloth. When she presents a chocolate cupcake to her baker and orders enough for fifty people "Just like this!", she receives a single giant chocolate cake.

Obviously, her draper mistook a sample for an exemplar, and her baker thought that a sample was a model. In real life, we do not have quite so much trouble making these distinctions in respect to the operation of particular examples.

Learning by example thus appears to involve some rather complicated cognitive efforts. At the very least, learning by example requires that the learner be able to distinguish between the relevant and the irrelevant features of the example, or of the referent, or of both.

The apparent sophistication of these processes might be enough to set the anticognitivists' teeth on edge, but we should notice that these processes are not beyond the ability of very small children. Indeed, Gardner and Gardner (as reported in Goodman, Perkins, and Gardner, 1972, p. 56) found that when they performed the action of opening and closing hands or mouth in front of their six-week-old infant, the child was more likely to reproduce the mode (opening and closing) and the vector (a steady repetition) than the particular zone (mouth or hand). Thus, at the age of six weeks, the child—who presumably could not yet handle denotational reference—was able to perform the activity of sorting out some of the features of an example.

We may recall the Aristotelian claim that the instinct of imitation is implanted in man from childhood and is the source of our ability to learn our early lessons. Aristotle makes this point at the beginning of the *Poetics* as he is starting to develop his cognitivist account of art. Imitation involves the construction and the understanding of exemplars and/or models. If art can be construed to refer primarily by exemplification rather than by denotation, we are in a position to respond to the anticognitivists' complaints.

Basically, the anticognitivists apply the denotative model to art and then point out that the conditions under which we learn to understand denoting devices do not typically or characteristically obtain in the aesthetic situation. What I now want to point out is that the apparent lack of determination about which anticognitivists complain, the emphasis on the single instance rather than on the general meaning rule as the structure for conveying significance, is a characteristic of exemplification in general. We have seen that exemplification is a mode of reference that even young children can handle and that it is the preferred mode of instruction in some situations. If exemplification has cognitive virtues that denotation lacks, and if art objects display these virtues, the anticognitivists will be unjustified in echoing Plato's condemnation that art perverts cognition's true and healthy aim.

Denoted referents are, in some sense, entities we directly encounter, while exemplified referents are, in the same sense, entities we cannot directly encounter. This sense of "directly encounter" is difficult to clarify without employing an excess of philosophical jargon, but some examples may clarify the point.

One way of teaching the meaning of a denoting symbol is by presenting instances of its application—that is, its referents or members of its compliance class. Thus, if one wishes to teach the meaning of *bedmaking*, one might present an exemplary instance of bedmaking. If one wishes to teach the meaning of *weed*, one might present sample weeds. When sample weeds or an exemplary instance of bedmaking are used to refer, the abstract notions *weed* or *bedmaking* (what Goodman calls labels) constitute the referents. As Goodman (1968, p. 65) says, "exemplification is reference running from denotatum back to label. . . . The symbolization or reference here runs in the opposite direction from denotation—runs up from rather than down to what is denoted" (Goodman, 1968, p. 53).

Much philosophical energy has been expended on constructing proposals about the nature of the referents of exemplification. These referents sometimes have been called ideas, or concepts, or images in the mind, or a great number of other things, depending on what epistemological proposal is at issue. The details of these proposals need not concern us here, since I believe that the view outlined in this essay remains neutral in respect to the various traditional accounts of the nature of these entities.

For purposes of the present discussion, let us call these entities abstract notions or concepts. All that needs to be said about them is that they differ in nature from the referents of denotation in the sense that the concepts of *car* or *dog* or *flower* differ from an actual individual car or dog or flower. One advantage, then, of exemplification is that it allows us to secure reference to a kind of entity to which denoting devices cannot successfully or adequately refer.

Devices that exemplify are richer, but are also less free, than devices that denote. Denoting devices are free because they can be made to refer to anything, while exemplifying devices can refer only as permitted by the properties they already possess. We might term this flexibility "dreadful freedom," however, for the arbitrariness that provides freedom for denoting devices also renders them passive. They can be made to refer, but this function is completely imposed on them. The cognitive prerequisite for employing a denoting device is the prior attachment of the referent or at least of the compliance class.

On the other hand, exemplificatory devices are fecund. They initiate reference. Every property of an example is a *prima facie* candidate for securing the referent. This is why artists sometimes discover that their works have wider or deeper significance than they had expected them to possess.

While the cognitive process required for denotation is a process of attaching, exemplification requires a cognitive process of cutting or sorting out. Signifying features must be separated from nonsignifying features, and then a referent that labels the signifying features must be found. While a denoting device is naked and must have its referents attached, an exemplificatory device is rich in possible referents.

There is a sense in which exemplificatory devices make themselves refer. This is not to say that they do not require intervention, for clearly nothing functions as an example unless it is taken to refer. But an exemplificatory device can generate references that have not been established prior to encountering the device.

Thus, if richness of reference is desired, exemplification is preferable to denotation. In the penultimate section of this essay, we shall see that there is at least one true and healthy cognitive aim for which richness of reference, as well as the ability to refer to abstract notions, is overwhelmingly desirable.

Transferring Cognitive Skills

So far we have discussed exemplification outside the context of the aesthetic. A thorough and ambitious program would require that at least two matters now be pursued. First, it is important to show that in cognitive situations which are common to aesthetic and nonaesthetic contexts, it is plausible to construe exemplification as the major mode of referring. Such evidence would attest to the transferability of cognitive skills across aesthetic and nonaesthetic domains. Second, it is important to show that construing exemplification as the major mode of referring in the aesthetic context constitutes a plausible account of the phenomena that are taken to be symptoms or characteristics of aesthetic appreciation.

Since extensive pursuit of this program is beyond the scope of the present essay, the discussion that follows will be suggestive rather than exhaustive. In this section, I will treat one sort of cognitive situation that is common to both aesthetic and nonaesthetic contexts. In the next section, I will indicate how construing references as exemplification permits us to assign to art a cognitive function that is compatible with one of the identifying characteristics of aesthetic appreciation.

Understanding what pictures convey is a cognitive activity that cuts across aesthetic and nonaesthetic contexts; that is, some contexts in which we understand pictures are situations involving aesthetic appreciation, and some are not. Thus the cognitive skills appropriate for understanding pictures are presumably ones that transfer across aesthetic and nonaesthetic domains.

As David Perkins (1975, p. 1) aptly points out, caricature proves to be both a nuisance and a guiding light for the analysis of pictorial representation. Caricatures eliminate some and exaggerate others of their subjects' features. In general, caricatures are as recognizable, and in some cases are more recognizable, than photographic portraits of their subjects. This phenomenon signifies that the cognitive processes that comprise pictorial recognition involve something other than seeing the picture as if one were seeing the subject.

Perkins (1975, p. 15) examined caricatures of a prominent political figure and identified four key features. No one of these features—all visually present in the caricatures—turned out to be necessary for recognition of the referent. Additionally, masking one of the key features produced less difficulty in identifying the referent than did changing the feature. Why should this be the case?

Perkins (p. 5) sometimes is inclined to speak as he does in the following statement: ". . . a caricature offers a proposition about a subject's physiognomy. . . ." This way of speaking construes pictures as functioning in the way that sentential symbols do—that is, as expressing propositions. But if caricatures function propositionally, it is hard to see why the change of an identifying feature should generate more difficulty in identifying the referent than does the absence of that identifying feature.

If a picture signifies propositionally, then presumably there are criteria that determine whether the proposition is true. This is because of the way that propositions refer. Propositions refer by denoting. Propositions attribute properties to subjects. If the presence of one property excludes the presence of another property, then a proposition that attributes the presence of the first property to the subject entails a proposition attributing the absence of the second property to the same subject. In respect to the satisfaction of a criterion naming the second property, there is logically no difference between attributing the presence of the first property to the subject and denying the attribution of the second property to the subject. Thus if a picture signifies propositionally, the elimination of criterial features and the alteration of criterial features should signify equally in respect to whether the picture-proposition satisfies the criteria for being true of the subject.

Let us suppose that *x* is an identifying feature of *A*, and that *y* is a feature whose presence excludes the presence of *x*. Let us say that *x* is a ski-jump nose and that *y* is a Roman nose. Then a true proposition that is critical in identifying *A* can be symbolized as "if *A*, then *x* (other things being equal)." (The connective, as Perkins notes, has to be taken to mean something like "rather necessary.") Given the logic of propositions, it should be the case that both "if not-*x*, then not-*A*," and also "if *y*, then not-*A*." But Perkins' results indicate that only the second of this pair of propositions holds for the recognition of the subjects of caricatures. This experimental result suggests that caricatures do not refer to subjects as propositions refer to subjects.

If, however, caricatures are construed as exemplifications, they are symbols that exhibit rather than denote features. While in the context of denotation a proposition expressing the absence of x and a proposition expressing the presence of *y* when *y* entails not-x are equivalent in denoting a state of affairs in which x is absent, grasping a reference in the context of exemplification involves the sorting of relevant from irrelevant features. A feature that is masked or erased from a picture prior to the picture's being seen is, of course, automatically sorted out. If an identifying feature is eliminated, the resultant configuration can still be taken as a model of the subject. The configuration is then taken to be a more schematic or restrained model than one possessing the missing feature.

On the other hand, if a feature is changed, then the altered or alternate feature is likely to be taken *prima facie* as relevant to the exemplification and thus is likely to engender a search for another subject or referent. That is, the elimination of a ski-jump nose in a caricature does not preclude recognizing a subject who possesses other identifying features exemplified by the caricature. But the exemplification of a Roman nose does indicate that the caricature is a model of something whose nose-shape is exemplified in the picture, and this indication of an alternative subject is likely to hinder recognition of the original subject.

Should we wish to construe caricatures as expressing propositions, then we must accept the logical constraints of the concepts that provide the propositions with meaning. Thus to take a case of zoomorphic caricature that Perkins (1975, p. 5) discusses, a caricature of Samuel Beckett that provides the Beckett-picture with buzzard features is difficult to analyze on the propositional model because the logic of the symbols of Beckett and of buzzard do not permit their attribution to the same subject. Therefore, they cannot be employed as predicates in a proposition such as the one expressed by "The subject is Beckett and buzzard."

But the logical relation holding between Beckett and buzzard that precludes applying both to the same subject and therefore precludes conjoint denotation does not preclude constructing a conjoint exemplification that refers to both notions. If two notions are incompatible, they cannot be applied, in ordinary circumstances, to the same thing. But it does not follow that the two notions cannot be referred to conjointly. Nature does not usually produce examples that refer conjointly to incompatible notions, but in this instance the hand of the artist can improve on nature.

In this section, I have discussed two cases of understanding caricatures. I have argued that in both cases construing reference as exemplification is preferable to construing reference as denotation. What is particularly significant here is that the same analysis seems appropriate for treating a nonaesthetic case—recognizing a prominent political figure—and for treating an aesthetic case—recognizing Beckett as buzzard. This is indicative of a cognitive operation that transfers across aesthetic and nonaesthetic domains, particularly if, as seems to be the case, recognizing caricatures is a paradigm for all pictorial recognition.

A True and Healthy Aim

I have argued so far that exemplification has its cognitive advantages. This is part of the response needed to meet the anticognitivists' objections. Nevertheless, the anticognitivists have a string remaining in their bow. They may insist that the hazards of understanding exemplifications overcome whatever cognitive virtues exemplification may possess.

In some cases, conventionalized expectation is powerful enough to provide uniform guidelines for the sorting-out process that is integral to grasping the referents of exemplifications. The history of Mrs. Mary Tricias is amusing, precisely because, in ordinary circumstances, the use of tailors' swatches is regulated by well-established expectations. If we did not have these expectations ourselves, we would not even see the joke.

We expect a swatch to exemplify texture, color, weave, thickness, and fiber content, but not size and shape. The restrictions that regulate the use of tailors' swatches, however, also militate against the cognitive virtues that characterize exemplification. The referring capacity of tailors' swatches (that is, of examples of cloth that are treated as tailors' swatches) is not particularly rich and fecund, nor are the referents of tailors' swatches particularly interesting abstract notions.

We may remark here that it would be extraordinary to be confronted with conflicting interpretations of a tailors' swatch. Indeed, it is odd even to speak of interpreting a tailor's swatch. But if conflicting understandings of a swatch did occur, we would be confident that only one could be correct. When Mrs. Tricias' draper takes the swatch to exemplify size and shape while Mrs. Tricias does not, it is obvious that a mistake has been made.

On the other hand, art objects are notoriously subject to conflicting interpretations. In many cases of incompatible understandings of art objects, we are not prepared to allow that a mistake has been made. In contrast to the interpretation of tailors' swatches, the understanding of art is not thoroughly regulated by well-established conventions or expectations. This special kind of indeterminacy has been considered as a characteristic or symptom of the aesthetic, and any account that rendered the understanding of art easily and thoroughly decidable would run counter to the differentia of aesthetic appreciation. Thus the referring capacity of art works may be rich and fecund, and the referents of art objects may be interesting, but the difficulties encountered in securing the referents of sophisticated art objects may be thought to interfere with cognition's "true and healthy aim."

Earlier I called the referents of exemplification "abstract notions." What kinds of interests might we have in referring to abstract notions? In some cases, employing a cognitive device that conveys an abstract notion is a way of conveying an additional mode or means of organizing or understanding. Thus, an exemplar of bedmaking enables a child to organize his or her actions into instances of bedmaking, sample weeds teach the child to distinguish weeds from cultivated plants, and a model iron helps the child to understand what ironing is like.

In other cases, employing a cognitive device that conveys an abstract notion is a means of focusing upon that notion. For instance, the famous duck-rabbit drawing is an example of a thoroughly ambiguous configuration. In most of its manifestations, the drawing is taken to exemplify not merely a duck configuration and a rabbit configuration (after all, other drawings of ducks and rabbits do not enjoy such prominence in the literature) but also the notion of irresolvable ambiguity. One can confirm this point by noticing that the discussions surrounding manifestations of the duck-rabbit drawing are not about ducks or rabbits but about perceptual ambiguity.

Ordinarily, the abstract notions that are means or modes of understanding the world function relatively smoothly. Ordinarily, then, the route from exemplification through abstract notion to application is also smooth. The child moves from exemplar or samples or model through feature sorting to bedmaking or weeding or ironing. Usually, the world organizes smoothly into familiar and determinate conceptual patterns.

But sometimes, as in the duck-rabbit and Beckett-buzzard cases, it does not. We both do and do not understand. This phenomenon may be called conceptual tension. It is occasioned by instances that do not fit comfortably into familiar conceptual organizations, by examples that do not neatly refer. (See Silvers, 1975 for further discussion of this point.)

While difficulties in applying concepts may be regarded as annoyances in practical contexts and as challenges for philosophy, these same difficulties often enhance aesthetic appreciation. For instance, *Oedipus Rex* forces us to reflect on the conceptual difficulties generated by the concept cluster that relates the notions of wrong action, intention, responsibility, and punishment. The play is engrossing in part because it exemplifies not a straightforward case of the punishment of wrongdoing but rather one in which the tensions and indeterminacies of employing this concept cluster become strikingly apparent. The play would be much less moving if we were clear either that Oedipus did or that he did not deserve his fate.

To take another example: Cubism is typically said to explore the problems inherent in a concept of physical objecthood that incorporates both visual and tactile properties. Cubist paintings exemplify both visual and tactile notions. They exhibit the tension generated by two equally usable modes of organizing or understanding physical objects. They force us to focus on certain aspects of the logic of perceiving physical objects.

Although I have employed the duck-rabbit figure to help convey my point, and although the duck-rabbit figure is characterized as an ambiguous figure, it would not be appropriate to conclude that the phenomenon isolated here is mere ambiguity. Ambiguous figures are either figures that have more than one possible meaning or figures that are unclear. It is characteristic of ambiguous figures that the alternative meanings attributable to them are mutually exclusive. Thus it is thought by nearly everyone that no one can see the duck and the rabbit in the duck-rabbit figure at the same time.

The duck-rabbit example is ambiguous between being a duck-picture and being a rabbit-picture. But the notions that the duck-rabbit figure places in conceptual tension are not the notions of duck-picture and of rabbit-picture. Rather they are a cluster of concepts having to do with perception. Notice that the duck-rabbit figure is not ambiguous between any of these concepts. By triggering multiple references, ambiguity is a tool for producing conceptual tension.

Therefore, I would prefer to propose that ambiguity is one among many figurational indeterminacies that may occasion conceptual tension. If the suggestions I shall make in the following section are useful, then one important matter to pursue in educational research is the identification, across the media, of modes of figurational indeterminacy. (I am presuming that one can talk about figures in the literary as well as in the visual and aural media.) For the reasons I shall discuss below, an inventory of these modes would constitute a valuable educational tool.

Exemplification but not denotation can convey conceptual tension. The ease of reference that denoting symbols display—the ease applauded by the anticognitivists—occurs because conceptual tensions are ignored or expunged. But there is value in focusing upon conceptual tension, for it is in cases in which concepts are strained that we become aware of some of the forces that inform cognition and of the strengths and limitations of our concepts.

Thus I am suggesting that the indeterminacy that characterizes aesthetic experience does have a true and healthy aim. The imagined world of the storyteller can inform us about the real world of experience, not by denoting properties of the real world but rather by exemplifying the notions we employ to organize and understand the world. In particular, examples that strain our concepts also sensitize us to them, even though the nature of the cognitive process here prevents us from arriving at determinate interpretations.

Exemplification and Education

It seems obvious, at least to a philosopher, that one of the major purposes of education is to engender the child's (or the adult student's) development of concepts. One can attribute this goal to education while remaining neutral on the question of whether concepts are taught or whether they are formed as stages in the individual's natural cognitive development. Regardless of one's position on this question, it is obvious that the artifices of the educator are useful in conceptual development. To see this, we need only recall that the young Helen Keller, even if she possessed anything on the order of innate linguistic structures, required the intervention of a teacher to master the fundamental linguistic activity of referring. What follows from this view of education is the pressing need to provide educators with tools for the development of concepts.

The account presented in this essay indicates that in the cognitive process there is a close and integrative connection between concepts and the instances to which they apply. This view runs contrary to much of our contemporary popular epistemological mythology, which tends to separate cognition into realms, characterized variously as the logical and the synthetic-perceptual, or as the propositional and the appositional, or as the conceptual and the artistic. It has been seriously suggested that there is no unity of cognitive processes, that we should think of ourselves as possessing two distinct minds, and that we must adopt two distinct educational approaches suited to the two distinct cognitive realms.[1] But if the account given here is plausible, this sort of distinction must not be allowed to predominate. My account of aesthetic appreciation indicates that there is a sense in which art appreciation is a conceptual enterprise, for the artifacts artists create are vehicles that enable us to reflect upon, probe, and develop our concepts. The account also suggests that conceptual ability enhances appreciation of art.

Art, then, constitutes an effective educational tool not merely because some of the cognitive skills integral to aesthetic appreciation are also integral to nonaesthetic cognition, but additionally because the indeterminacy that is a symptom of the aesthetic can be of value in conceptual development. Art objects can be employed to help students focus on the abstract notions that the objects exemplify. Obviously, this procedure will be successful only to the extent the art objects employed for general educational purposes are ones that engender conceptual tension. Therefore to take the best advantage of the conceptual benefits of aesthetic education, we must select those objects that most markedly display the relevant aesthetic symptom. We must select excellent rather than run-of-the-mill art objects.

Which art objects to choose is not to be determined solely by discovering which objects children prefer, since children may prefer objects for reasons other than their efficacy in concept development. In this context, it would be important to try to correlate the development of appreciation for particular art objects with the independently measured development of the concepts that the objects exemplify.

To pursue such research, we must find methods of identifying the concepts art objects exemplify. This does not entail producing a methodology that generates a single, definitive interpretation of each work since such an expectation would be inconsistent with the indeterminacy on which art's concept-reflective capacity rests. Concepts must be identified in ways such that we can test the extent to which children have grasped and developed them. It is particularly important to learn what strengths and weaknesses each medium possesses in respect to the concepts that can be exemplified in it, although a caveat is again needed, since we should recognize that the artist, creating new exemplifications, may extend the range of concepts exemplified in his or her medium.

We also need to obtain better explanations of the processes involved in understanding art. What I have been developing in this essay is a model, not an explanation, of aesthetic cognition. Models of aesthetic cognition can only form theoretical frameworks that direct the interpretation of data. In what follows, I shall give some indication of some conclusions that the application of the model presented here suggests. The model presented here can be used to interpret some anthropological data so that variables affecting the process of understanding art are revealed. Muldrow (as described in Deregowski, 1973) reports that when the Me'en, a remote Ethiopian tribe, were given a page from a coloring book, they would smell it, examine its texture, listen to it while flexing it, even attempt to taste it, but would entirely ignore the picture. When shown pictures printed on coarse cloth, a material with which they were familiar, however, the Me'en had little difficulty identifying the subjects of the pictures.

How can we explain the Me'en's behavior? The Me'en apparently were able to recognize the subject of the pictures only after they had sorted the relevantly signifying features of the cognitive device from the irrelevant ones. Their sorting seems to depend in part on their familiarity with the various features. When the material on which the picture is printed is unfamiliar to them, they take it as significant and examine it further. When the material is familiar, they sort it out as irrelevant to securing the reference of the exemplification.

Although it is, of course, dangerous to generalize from one instance, the behavior of the Me'en in this case suggests a cognitive tendency to treat unfamiliar features as *prima facie* relevant to reference. Thus in the context of exemplification—but not in the context of denotation—originality, which by nature involves the introduction of unfamiliar features or aspects, can serve to increase referential power. If there is a tendency to take unfamiliar features as *prima facie* referentially significant, then originality in constructing the features of an object aids in sorting the signifying from the nonsignifying features of the object.

Deregowski (1973, p. 184) reports that young children, "unsophisticated" Africans, and inhabitants of engineering design offices prefer split-type drawings to profile or orthogonal drawings, while the preferences of sophisticated Europeans run in the opposite direction. These results are sometimes interpreted to show that unsophisticated Africans and children have not attained the level of cognitive development required to understand what profiles or orthogonal views represent.

What we should notice, however, is that split-type drawings are preferable for some referential purposes. If one wishes to refer to the number of eyes or legs possessed by the drawing's referent, as well as to their relative locations, split-type drawings are more useful exemplifications than are profiles or orthogonal views. The preference of children, unsophisticated Africans, and engineers for split-type drawings may be attributed to the range of concepts that these groups find most interesting and useful. Children, unsophisticated Africans, and engineers may be interested in physical object property concepts, while sophisticated Europeans may be interested in appearance concepts. We may note here that the reappearance of perspective drawing in Europe was embedded in a set of philosophical views about which group of concepts was most important in understanding reality. Thus interest in the relevant concepts may also be a variable determining how successfully any individual grasps the references of exemplifications.

These conclusions, if acceptable, show that art objects must be fresh rather than clichéd to be fully successful as tools in conceptual development and that they must refer to concepts students are disposed to find interesting or useful. Of course, a dialectical relationship exists here, since the way that an art object reflects or exemplifies a concept may expand a child's interest in the concept. What we may further conclude is that art cannot be fully appreciated in isolation from other human cognitive endeavors, nor can those other endeavors develop as fully in the absence of art. Thus art education cannot be considered a mere curricular embellishment. To the extent that we relegate aesthetic education to the realm of educational frills, we will be guilty of wasting a possibly irreplaceable educational resource.

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NOTE

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D. N. Perkins / *A Response to Silvers*

The Significance of Interpretive Disagreements for Cognitive Theories of the Arts*

Is a cognitive or a noncognitive account of the arts to prevail? And further, what does either sort of account really claim? To address these questions, one sort of anticognitivist might begin with the following excerpt from *Time*, May 30, 1977:

> "Grandma—on the cloth. See? There is God's face." A little girl named Iris Reigle spoke those words at the end of a prayer meeting at Holy Trinity Episcopal Church in Shamokin, Pa. The 25 worshippers looked at the white brocade cloth covering the altar tabernacle where consecrated bread is kept. On the cloth, in use for 15 years, they now saw a pattern of shadows that seemed to them to resemble the face of Jesus.
>
> . . . By last week the number of visitors had passed 60,000, even though news accounts of the "miracle" cloth have been spotty.
>
> . . . while most see what they consider to be the face of Jesus, others discern two kneeling figures or Jesus standing with a staff or the Virgin Mary.

Art, the anticognitivist would say, is like the miracle cloth. Response to art is an act of faith and a vision drawing more on what the individual perceiver can bring to bear than what the work declares. There is nothing cognitive about this. Cognition taken most broadly refers to processes of knowing. But like the miracle cloth, works of art present no one definite thing to be known and they inform the perceiver of no definite matter. Indeed, a cognitive perspective is misleading. It fosters attempts to pin a work down to what the work "really" says. Such efforts misuse a work of art. Rather, one needs to make the most of the work one can in one's own personal way.

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What is my evidence, the anticognitivist might continue, that works of art operate like the miracle cloth? Simply the interpretive disagreements so commonplace among audiences. That so many cannot agree on what a work says shows that a work says no one thing. With that, I rest my case.

But Anita Silvers would not be pleased to let the case rest there. In fact, an example of her own makes something quite different out of interpretive disagreement. Instead of the anticognitivist miracle cloth, Dr. Silvers mentions the famous duck-rabbit drawing, which can be seen either as duck or as rabbit. Here is a figure with contradictory readings, she notes. But the contradiction has a point. The figure is actually used by psychologists and philosophers to exemplify irresolvable ambiguity. This is not contradition that confounds but contradiction that informs. Dr. Silvers proposes that the same can be said of uncertainties in many works of art. *Oedipus Rex* provides one example. Did or did not Oedipus deserve his fate? Certainly people might disagree. But this very uncertainty makes the play that much more moving. Furthermore, as with the duck-rabbit, the uncertainty informs. The uncertainty leads us to know the ambiguities and limits of such notions as wrong action, intention, responsibility, and punishment, and so sharpens our understanding of them. More cognitive than this you can't get.

What can be made of this rivalry between duck-rabbit and miracle cloth visions of art? Which is art most often really like? It is hard to answer such a question decisively. But Dr. Silvers' essay creates an opportunity to explore the question more fully. In fact, two matters demand a very careful look. First, the rivalry concerns what interpretive disagreements really reflect—a duck-rabbit or a miracle cloth situation. But there are more situations than these which might account for disagreements. I will attempt a brief survey of them. Second, the debate could involve many meanings of cognition. I will attempt to distinguish three meanings. I will discuss what each alternative situation regarding interpretive disagreements implies for each alternative meaning of cognition. (A somewhat different discussion of what a cognitive theory of the arts amounts to can be found in the Introduction to Perkins and Leondar, 1977.)

Knowing What a Work Says

In general, Anita Silvers takes a cognitive view of the arts. In particular, she defends the notion that works of art are symbols. They operate to denote, exemplify, express. To experience a work of art properly is to "read" its symbolic statement. This is a cognitive position because it lays stress on a kind of knowing—knowing what the work says or, more formally, symbolizes. Dr. Silvers cites Nelson Goodman as the champion of this position and reviews and somewhat extends his case for one mode of symbolizing called exemplification.

Interpretive disagreements threaten this cognitive-symbolic theory of art. If works really can be read for what they say, why do people so often disagree about what is said? But perhaps interpretive disagreements do not follow through with their threat. The bark may be worse than the bite. Imagine two conflicting interpretations *A* and *B* of some work. Consider what might be made of these and what implications would follow for a cognitive-symbolic account of the arts.

1. *Resolvability*

Suppose an extensive, careful, and fair-minded effort finds evidence in the work decisively favoring *A* over *B*. This does not challenge a cognitive-symbolic view. On the contrary, it supports such a view, arguing that the disagreement needed a more careful reading of the work to resolve it. There was no real ambiguity. *B* was simply mistaken.

Dr. Silvers mentions only in passing the possibility of mistaken interpretations. I would like to emphasize that possibility. Is it naive to imagine that many disagreements simply reflect mistakes? I think not. First of all, many disagreeements are never put to the test. They get no further than simple confrontation or cocktail party conversation. Second, I have argued elsewhere that when serious discussion does occur, ineffective management of the dialogue often leads to failure to isolate and pursue issues. For these two reasons, the mere presence of frequent disagreements should not be taken as a sign of their permanence. In addition, I have also argued elsewhere that one can find many cases where apprehensions of art should clearly count as errors (Perkins, 1977). This even applies to sophisticated criticism. Monroe Beardsley (1970, pp. 16-61) has shown by example how interpretive disagreements among experts can sometimes be settled (to his mind) by careful attention to the work.

But suppose one cannot muster a clear case for either *A* or *B*. Then what?

2. *Uncertainty Symbolized*

Anita Silvers has presented a second possibility. Her answer basically makes a virtue out of what the anticognitivist would hold to be a vice. Not merely ambiguous between a duck and a rabbit, the duck-rabbit figure symbolizes perceptual ambiguity. Likewise, not merely confused concerning the justice of Oedipus' fate, *Oedipus Rex* symbolizes—by exemplifying—the dilemma posed by the uncertainties in our concept of justice.

But for many works anticognitivists would have an easy objection. They could point out that the rivalry between *A* and *B* begs to be resolved. One really does want to decide that the work says *A* and then to forget about *B*, or vice versa. The ambiguity does not inform; it confounds. Then what?

3. *Confused Work*

In some cases, one might conclude that the work is confused. In fact, critics often do accuse works of being unclear. This does not bring a symbolic view of the arts into question. To say that people sometimes use symbols in a confused way is not to doubt the symbolic character of what they seek to do.

But suppose such an accusation seems amiss. Rather, *A* and *B* both appear to be fruitful perspectives on the work with no need for the artist to have indicated a choice between them. What then?

4. *Interpretation in the Performance Sense*

One might decide that the interpretations rival one another in the benign way that interpretations of a symphony or play can, as in those situations where very different interpretations may respect the work and still claim respect for themselves. It could be argued with some justice that a similar concept of interpretation applies to the nonperforming arts. One usefully and perhaps inevitably goes beyond what the work says to flesh it out for oneself. For instance, in reading a novel one may visualize events with a detail exceeding the author's explicit descriptions.

Such imagining sounds like a severe threat to a cognitive-symbolic position. It extolls the virtue and necessity of reading-in. But the way interpretations are often criticized demonstrates the continued priority of what the work symbolizes over reading-in. Critics will berate interpretations for ignoring or distorting what the work says. So long as reading governs reading-in, a cognitive-symbolic view survives.

But suppose it does not seem reasonable to claim that what the work says severely constrains whatever interpretations are proposed. How can this happen?

5. *Radical Ambiguity*

One way is as follows. There may be an explosion of contrasting interpretations, all of which more or less fit the work. The miracle cloth provides a metaphor for this. Does the miracle cloth show Jesus' face, Jesus with a staff, kneeling figures, the Virgin Mary? To ask what the miracle cloth really shows makes about as much sense as asking what a Rorschach inkblot actually depicts. The same radical ambiguity conceivably could occur in art. Indeed, some works of art more or less deliberately appear to follow this philosophy. Unstructured, they mean to invite projection more than to channel perception. Yet they do so not to symbolize ambiguity, but simply to provide individual experiences to individual audience members. Now suppose that for most works consideration of rival readings led to dozens of other contrasting interpretations. Suppose that on examination, works usually seemed to become much less rather than much more restrictive on what interpretations might apply. This would seriously undermine a cognitive-symbolic position.

What if this does not happen? Can anything else go wrong with a cognitive-symbolic perspective?

6. Mutual Incomprehension

Up to now, I have presumed that consideration of *A* versus *B* can at least proceed, if not lead to a decision. But perhaps not. Perhaps a party espousing one interpretation would have difficulty understanding what the other means. The miracle cloth provides a metaphor for this possibility also. One party who has seen Jesus' face might attempt to share his or her seeing with another who has seen Jesus standing. But the attempt might easily fail. Try as they both might, the seeing may not fall into place for the second party. Such things certainly happen in discussing art. Something will simply look wrong to one and right to another, strong to one and weak to another, realistic to one and askew to another, with nothing more to be said—the looks of things do not always lend themselves to the giving of effective reasons or explanations. As with radical ambiguity, the frequent occurrence of circumstances of this sort would severely shake a symbolic-cognitive view of the arts. If mutual incomprehension is too often the case, the notion of sharable perceptions of art upon which a cognitive-symbolic view must be based comes into question.

The foregoing discussion lists six different circumstances of interpretive disagreement. Four fall short of being a threat to a cognitive-symbolic position. Those four must all fail before the cognitivist gets into trouble. Therefore, our anticognitivist cannot casually commandeer the phenomenon of disagreements to favor his or her case. In fact, to state my bias, I do not think it plausible that the extreme situations exemplified in numbers five and six would occur that often.

Knowing the Work

But suppose they did. What recourse might a cognitivist have? A cognitivist might appeal to another meaning of "cognitive." Besides knowing what the work says, one might speak of knowing the work. Of course, to know what the work says is to know the work in one way. But there may be other ways. Knowing the work is more general than, and it includes, knowing what the work says.

In effect, a cognitivist's answer to situation five carries Dr. Silvers' argument further. With radical ambiguity in mind, an anticognitivist would deny that there is any one way of knowing the work. The cognitivist could reply: then to truly know the work is to know it in its ambiguity. It is of course to know what ambiguities the work symbolizes, as Dr. Silvers has illustrated with the duck-rabbit figure and *Oedipus Rex*. But it is also to know how the work's symbolizing is itself ambiguous. Therefore, the cognitivist would say, ambiguity is no excuse to drift off into personal idiosyncratic interpretations. It is just a trap we may fall into along the way toward a comprehensive view. We may think we know the work when we see only interpretation *A*. But we come that much closer to knowing it when we see *B* as well.

This is so even of a Rorschach inkblot. To know what a Rorschach inkblot is, is not just to recognize that it looks like a butterfly, but to recognize the many ways it can appear.

This ploy does not apply so neatly to situation six, mutual incomprehensibility. When one cannot see what others mean, one cannot achieve the comprehensive overview suggested above. But one might still come to know the work in a weaker sense. Consider a trivial example. Suppose a painting looks balanced to one party, but a little off-balance to another. The first party cannot catch the other's seeing of it. Still, the first party knows from other experiences what it is for a painting to look unbalanced. So he or she has some rough idea of the other party's experience even though he or she cannot capture it. In general, a person at least may come to know what interpretations others hold, even when he or she cannot always share the perceptual experiences underwriting those interpretations.

Knowing the World Through the Work

Neither sense of cognition discussed so far reflects Plato's misgivings about art, which open Dr. Silvers' paper. Plato did not worry about whether one could know the work. Rather, he doubted whether the work was worth knowing. What could the work teach its audience about any part of the world other than the work itself? Would there be an extra-artistic payoff of knowledge? Works of art, Plato feared, dealt too much in fictions. They also derived from and thus promulgated an irrational, haphazard state of mind, Plato thought. Art misled rather than informed.

Dr. Silvers' essay stresses one way in which works inform even though they are fictions. Works like *Oedipus Rex* inform by fostering awareness of vagueness and ambiguity in our concepts. This reply to Plato refers only to situation two, where rival interpretations really reflect ambiguity symbolized. But I think Dr. Silvers' position generalizes to answer Plato along a broader front.

Of course, Dr. Silvers' argument makes an important assumption. The rival interpretations must be recognized for what they are. The audience member who only notices one interpretation, or who clings blindly to one if informed of others, gains nothing. A generalization of Dr. Silvers' argument requires that same assumption generalized. The audience member must recognize the existence and status of whatever ambiguities the work presents. In fact, this amounts to something familiar—what the last section called "knowing the work."

Assuming an audience that knows the work, how do the circumstances of disagreement stack up against Plato's misgivings? In fact, all the situations appear more or less informative. Controversy and uncertainty, if intelligently pursued, are inevitably informative. An audience member's effort to seek out alternative readings and to synthesize or otherwise relate them cannot help but exercise his or her concepts. Furthermore, the aggressive, inquiring, and judicious state of mind required for this counters Plato's fears of irrational, haphazard thinking.

In fact, the least informative situation was not discussed. I assumed a controversy—*A* versus *B*. But by the measure of Dr. Silvers' argument, complete lack of ambiguity from the first informs least, because it fails to challenge the audience to apply concepts in adverse circumstances. Apparently, the informativeness of works relates to a good principle of aesthetic value: works of art ought not to be obvious, stereotyped, routine; they ought to be subtle, novel, provocative. The better the art in these respects, and the more the audience strives to know the work, the less plausible the Platonic misgiving.

A Matter of Values

Imagine one knew just which circumstances of disagreement prevailed and how often. It would be naive to think that that would settle the cognitive-anticognitive controversy. Not only matters of fact, but matters of value are involved. Suppose that the results lay on the table, and that situations one through four proved dominant, favoring a cognitive perspective. The ardent anticognitivist would remain unmoved. At best, he or she would say, that shows what could be done if anyone ought to or wanted to. But only by approaching works in as personal a way as possible, however idiosyncratic that might be, would people find the most genuinely rewarding and significant experiences of art.

Imagine the opposite outcome: situations five and six dominated—radical ambiguity and mutual incomprehensibility. The ardent cognitivist would shrug and say, So artists and their audiences are more muddled than they both realize. That is no reason not to try. Only by striving to isolate the objective core of each work, however small, will audiences come to what is most genuinely rewarding and significant.

That die-hards die hard still does not say that the true situation regarding disagreement is not worth knowing. In fact, the whole cluster of phenomena surrounding interpretive disagreement, discourse about art, differences in perception, and so on deserves much closer attention. A close empirical look at such matters could give considerable information about what the actual practices are and about what other practices might be practicable. Such a look would reveal much about the pragmatics of cognitive and anticognitive postures and procedures. Perhaps of more importance than this somewhat vague and overarching issue, such a look would yield valuable information about how and how well people deal with problems of disagreement and indeterminacy. Understanding of these matters has import far beyond the borders of art.

In Summary

What does all this come to? Dr. Silvers can be thanked for defending a cognitive-symbolic view of art. The ambiguity of art does not pose the threat it might. It is often ambiguity symbolized, rather than merely ambiguous symbolizing. Dr. Silvers can also be thanked for answering Plato's misgivings about art in the case of ambiguity symbolized. Though they be fictions, works that symbolize in such a way inform by illuminating the limits of our interpretive concepts, concepts that apply to the real world as well as to the world of art.

In addition, Dr. Silvers' arguments generalize to make some broader points. Whether or not it is a symbol-reading process, experiencing art can be a knowing process. Ambiguity does not threaten this. Both ambiguity symbolized and ambiguous symbolizing can be known, if not read. Furthermore, whenever one strives to know the work and the work does not yield easily, Plato should feel reassured. Like ambiguity symbolized specifically, any effort to resolve uncertainties generally would inform us about our conceptual apparatus.

There is one more lesson to be drawn. The arts might require cognitive processes—that is, processes of knowing—in many senses. I have spoken only of three. "Cognitive" is a rather ambiguous word. It is certainly more ambiguous than many works of art. We cognitivists each see our own favorite postures in it. One might say that the concept of cognitive is our very own miracle cloth. Think of the danger that implies. But also, the opportunity.

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David R. Olson

The Arts as Basic Skills: Three Cognitive Functions of Symbols*

In this paper I shall discuss three functions of symbols. The first two, which have relatively little to do with the arts, relate to the purely intellectual functions of symbols—symbols as exploratory devices and symbol systems as modes of thought. While extremely important, these have been discussed elsewhere and hence will only be touched upon here (Olson, 1970; Olson and Bruner, 1974; Bruner and Olson, 1978). Of course, the third function of symbols, their aesthetic function, is more relevant to the arts and the majority of the paper is directed to some preliminary conjectures about the aesthetic aspects of symbols and the ways symbols may be specialized to serve a distinctive aesthetic function. I conclude with discussion of the relations between functions.

Symbolic Structures and Symbolic Functions

Much of the work on symbols, particularly linguistic symbols, has been in the tradition called "structuralism." The central concern has been to describe the set of symbols and the relations among them that exist "in the language," independent of how the symbol user—a speaker, for example—uses them for some particular purpose on some particular occasion. This orientation is clearly seen in Chomsky's (1972) discussion of the invariant properties of the linguistic system per se:

> If I use language to express or clarify my thoughts, with the intent to deceive, to avoid an embarrassing silence, or in a dozen other ways, my words have a strict meaning and I can very well mean what I say, but the fullest understanding of what I intend my audience (if any) to believe or to do might give little or no indication of the meaning of my discourse. (p. 24)

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Fodor, Bever, and Garrett (1974) express the same view: "We cannot ask pertinent or insightful . . . questions about how the semantic system of a speaker-hearer is used, or about how it is learned, until something substantial is known about the properties of the system" (p. 220). That is, in their view, the analysis of structure is independent of, and prior to, the analysis of function.

Some recent work on language has, however, proceeded on a quite different assumption; namely, that an understanding of symbols can be developed from an analysis of their functions—that is, from the analysis of pragmatic aspects of symbols. Speech act theory and its derivatives exemplify the productivity of this approach (Austin, 1962; Searle, 1969; Bates, 1976).

Similarly, Goodman's (1968) analysis of the "language of art" is primarily a structuralist one—an analysis of the elements and their syntactic and semantic properties. That analysis has done a great deal to show that "the arts" are no less symbolic than language and mathematics even if they often employ symbols having somewhat different properties from ordinary language.

My attempt in this paper is to approach the study of symbols from a functional perspective, without denying the validity of structural analysis. My questions, then, are: What are some of the functions that symbols serve? Can those functions be differentiated? And, can symbols be specialized to serve one of those functions at the expense of some of the others?

Symbols as Exploratory Devices

Scientists, like artists, are in continual search for ways of applying symbolic systems to their ordinary experience. Translation into a symbolic code such as logic or mathematics is taken as the criterion for "understanding" a phenomenon: to express the relation between temperature, pressure, and volume in the form of an equation is to explain that relation. Hanson (1958) goes so far as to say that scientific knowledge consists of *statements* known to be true. That is, what we know, or think we know, is not even knowledge unless it is given the appropriate symbolic form.

But it is not only scholars, poets, and scientists who constantly seek to cast experience into symbolic forms. Children, too, in trying new forms of activity, in their play, in their drawings, and particularly in their questions, are formulating and revising what they believe, know, suspect, feel into the forms provided by the symbolic systems of the culture. It is, as Dewey (1938) suggests, a matter of "going over one's past experiences to see what they yield" both for the purpose of facilitating the construction of a shared "intersubjective" world and for the purpose of rendering one's own personal experience comprehensible. This coding and recoding can occur in any symbolic system, but it is clearly represented by the poet's or essayist's search for the appropriate phrase or summarizing aphorism and by the scientist's search for the most general mathematical statement. Merleau-Ponty (1962) has this in mind when he suggests that an intention becomes complete in saying something. Such linguistic formulation is responsible for the radical economization of the experience of the tribe or nation in a few great myths and, more generally, for the world view implicit in one's native language. It should not be assumed, however, that this process is one of simple translation. It generally requires that the creator have more information available than was required for the ordinary experience of the event. This can easily be seen in the difficulties one encounters in an attempt to draw a map of a well-known territory or to give a description of a friend's appearance. New requirements, new purposes, or new activities require that we pick up new cues or information and as a result elaborate our perceptions of events. This is no less true when these activities involve those that have been shaped by or evolved from the culture, as in the arts, than when they involve various practical or physical acts. It follows that such symbolic activities as drawing an object, describing an object, or photographing an object require somewhat different information about that object than does the physical manipulation of the object. To the extent that these new forms of cultural or symbolic activity require previously undetected information about the world, the media of expression and communication are *exploratory* devices—a point of immense importance in the understanding of the child's acquisition of knowledge.

Let me refer to some experiments on obliques to illustrate how a medium of representation can require that new information be extracted to produce a more elaborate mental representation. Anat Scher (1976) recently showed six-year-old children an oblique line positioned in one of four quadrants of a square and asked them to say "same" or "different" to a subsequently presented oblique on the basis of its orientation. She found that children based their responses upon two factors: the position in the display (if the stimulus picture and the response picture showed an oblique in the same position, children tended to say "same"; if it occurred in a different position, they tended to say "different") and whether or not the compared obliques fell on or off a major axis of the display (if they both fell on an axis or off an axis, children tended to say "same"; if one fell on an axis and the other fell off a major axis, they tended to say "different"). These two factors accounted for 98 percent of the variance.

Now, if these two features are detected in a display, the child should have little difficulty constructing a diagonal in a medium where these features are primary, such as in *B* in *Figure 1*. In *A*, however, the primary axis becomes relatively invisible because of the predominance of the rows and columns of the display. In that case, the features the child has used to represent the display are inadequate. Indeed, Olson (1970) found that children of about four years of age had no difficulty reconstructing an oblique on *B*, but they experienced great difficulty on *A*. With practice and exposure to the structure of the

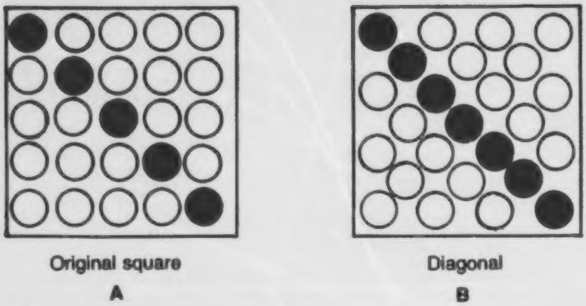

Figure 1. *The two types of checkerboards used.*

From *Cognitive Development* by D. R. Olson, New York: Academic Press, 1970. Reprinted by permission.

medium of *A* (when, for example, the checkerboard was left in a nursery classroom for a year), the children came to be able to construct the pattern on *A*—presumably because the encounter with the medium permitted the child to detect some further information about the visual pattern.

Adults also represent the properties of lines in terms of elaborated symbolic systems when recognizing the orientation of an oblique line occurring in different positions. Olson and Hildyard (1977) found that adults coded the information in terms of dimension and direction and their composites, such as "up to the right" or "up to the left."

I suggest that in each of these cases the partially unique informational requirements of a form of activity including symbolic activities provide the occasion for the extraction of new information. It is in this sense that I refer to media as exploratory devices: they provide the occasion for the elaboration of one's knowledge of objects and events.

Symbols and Cognitive Skills

Not only does the attempt to cast information into an explicit symbolic form lead to the detection of further information about the world but the symbol system thus formulated may serve as a form of thought permitting the clarification, systematization, and comprehension of events. Symbols are applied to one's experience not only for the purpose of elaborating one's perceptual knowledge, but also for constructing autonomous symbolic representations or symbolic objects that may be manipulated, examined, organized in their own right.[1] The manipulation of and operation upon these symbolic systems, within their own structures, are what I refer to here as forms of competence or symbolic skills. To use an earlier phrase of mine, "intelligence is skill in a medium" (1970, p. 193).

What of these skills? Skills are frequently rendered invisible by our habitual focus on the knowledge specified through the activity. As we examine a rock by turning it over in our hand, we are aware of the fact that we acquire knowledge about the rock, but the skilled manipulation that gave rise to the knowledge of the rock is transparent to us. Yet, applying that feat of manipulation to widely divergent objects or events will result in the development of a skill of wide applicability. Similarly, if we understand a sentence about an animal, we acquire explicit knowledge about the animal; but the linguistic processes we employed in extracting that information may have been quite elaborate without our being aware of them. If we look at the general skills that make up our cognitive or intellectual ability, we see that they are marked by the same property of invisibility. Verbal, numerical, and spatial abilities reflect skills with such symbolic activities as speaking, writing, counting, and manipulating Euclidean space—skills used widely, often without awareness of the symbolic forms themselves.

Let us consider these skills in more detail. Piaget (1960) demonstrated that the structure of any ability must be conceptualized in terms of "internalized activity." Activities carried out in the physical world—rotating an object in space, lining up objects to form a straight line, ordering objects serially—come to be internalized and carried out mentally. The temporal ordering operations, which permit an appreciation first of physical order and then of logical relations, are even more important. Once we can convert back from a changed state to our original one, we come to appreciate that such reversibility is a reliable property of events and not simply an act we perform. In turn, such operations make it possible for us to transform a novel event into a standard or base event, or to convert a base event into a new structure more appropriate to novel contexts.

The operations specified by Piaget were primarily those appropriate to the manipulation of real objects in the physical environment. Such operations have a wide range of applicability and appear to be almost universally relevant to problem solving. But internalized activity related to the physical environment does not begin to describe the range of activities of the human mind. Specifically, it leaves out an account of how we learn to cope with the cultural or symbolic environment.

Learning from the culture, like learning from physical activities, involves not only the act of picking up information to decide among alternative symbols, but also the skill of applying particular symbol systems to events to produce symbolically coded knowledge of reality. Sentences, for example, to the extent that they are about something, contribute to a general knowledge of reality. But the linguistic skills of assigning linguistic descriptions to experience whether in prose or poetic form are both specific and generally applicable to a wide variety of semantic contents.

Skillful use of a symbolic system involves the mastery of both its structure and its rules of transformation as *modes of thought*. Once mastered, these symbolic skills may be considered as *forms of intelligence* primarily because the range of their applicability is virtually limitless. Thus explicit logical prose may be applied to a certain problem in the hope of representing and thereby explaining it, while poetry may be applied to another in the attempt to exemplify a certain feeling or perception. In still another instance, mathematics may be applied to a phenomenon, as was the case when the binomial distribution was found to provide an appropriate description of the range of human variability. In this way, our use of symbolic systems for learning, like our use of practical activities for the same purpose, results in versions of "reality" appropriate to the form of symbolic activity. Reality is not merely "copied" or "imitated" in our symbols: reality is that set of descriptions appropriate to the kinds of practical and symbolic activities in which we engage. Thus Nelson Goodman (1968, p. 6) is led to say that "the world is as many ways as it can be truly described." Similarly, Cézanne pointed out that the artist does not copy the world in a medium, instead the artist recreates it in terms of that medium. Whorf (1956, p. 213) was among the first to argue that we "dissect nature along lines laid down by our native language." But the process probably goes even beyond that to include dissecting nature or creating artifacts in terms of whatever symbol system one considers relevant, useful, or interesting. For the child, as for the creative artist, an important form of activity involves the process of expanding and refining the code, of defining "lawful" or "comprehensible" or "possible" options, and of learning to apply that code to a variety of novel problems. Hence, I suggest that skill in the use of a symbolic code constitutes a mode of thought.

Again, let me illustrate this use of symbols as a generalized or transferable mode of intelligence by reference to some experimental work, this time the application of verbal descriptions to visual states of affairs. William Ives (1976) has recently replicated and extended the joint Piaget and Inhelder (1956) studies of the so-called "Three Mountain Tasks" in which children view a display of a geographical terrain consisting primarily of three mountains from a certain perspective and are asked to select a picture corresponding to the view that an observer or camera would have from some *other* perspective. Piaget's findings, interesting in their own right, are that children can succeed with this task at about nine or ten years of age. They solve the problem by coordinating their own view with the view of the hypothetical observer, either by mentally rotating the display or by imagining their own motion relative to the display.

There are two new factors in Ives' study: first, for some of the tasks he used objects having well-known intrinsic spatial features such as fronts and backs; and second, he encouraged the children to assign verbal spatial descriptions to the displays ("front," "back," "side," and the like) prior to either describing or selecting the view of the observer. The findings were not only that egocentric errors virtually disappeared when the child assigned such spatial descriptions, but also that the item difficulty was a function of *the complexity of the verbal descrip-*

tion and was independent of the angle of separation between the child's and the observer's perspective. This suggests that the ability of the child to assign a symbolic description, in this case with language, to the relation between a feature of the display and the observer ("He sees the front of the car") serves as a basis for mentally coding the relation and for selecting among alternative pictures. In this way, the symbolically described world permits one to go beyond the world as initially seen visually or as imagined. And the child who is skilled in the application of spatial descriptions to perceived events is equipped with a general and powerful mode of thought.

The Functional Specialization of Linguistic Symbols

Thus far I have discussed symbols as forms used for the representation of various aspects of experience to yield particular types of knowledge structures. While I have indicated how symbols play an important role in scientific cognition, I have said nothing pertaining to the arts or to aesthetic cognition. The use of symbols for constructing "objective" knowledge and for carrying out certain intellectual operations does not exhaust the functions of symbols in the culture or in the cognitive process of individuals. Just as sentences may be shown to serve practical, pragmatic, social, interpersonal, and aesthetic functions in addition to the logical truth function, so other symbol systems may be considered in terms of those functions thev serve in addition to their more frequently recognized cognitive or intellectual uses.

Any one of a number of theories (Buhler, 1934; Austin, 1962; Searle, 1969) could set the stage for a discussion of the functions of language. The two classes of language functions that have received the greatest attention are (1) the functions of regulating social relations between participants and (2) the functions of maintaining logical relations between sentences and situations. Extending the work of Buhler (1934), Popper (1972) has argued that there is an evolution from animal languages to human languages—from the "lower" interpersonal signalling functions shared by animals and humans that are useful for coordinating and controlling the behavior of others, to the "higher" semantic functions that are found only in human language and are useful for constructing true and valid descriptions. If these functions can be differentiated, it is tempting to see if one can find in the structure of the language a basis for differentiating sentences that state something from sentences that do something—what Austin (1962) called constative and performative utterances. In his book, Austin decided that the enterprise was futile and that rather than differentiating between sentence types, it was more productive to say that language simultaneously serves multiple functions. To say "The window is open" simultaneously communicates information and intention: in this case, the information that the window is open and the request that someone close it. Thus any sentence is simultaneously a locutionary act and an illocutionary act.

Some interesting developmental evidence has tended to support this type of analysis. Halliday (1974, 1975) found that at about one year of age a child has control of five distinctive expressions by means of which he or she achieves five distinctive functions: instrumental, regulatory, interactional, personal, and imaginative. By about two years of age the child has integrated these functions into the three primary functions of an adult's language: the interpersonal, the ideational, and the textual. With development, the child's utterances become plurificational such that the logical subject of a sentence is determined by the ideational function, the grammatical subject by the interpersonal function, and the psychological subject by the textual function. Other studies by Buhler (1934), Nelson (1973), and Bates (1976) have confirmed and extended the case for the progressive integration of functions in the acquisition of language in children.

While the acquisition of language involves the integration of functions, the higher forms of adult competence in a literate, modern society appear to involve the differentiation and specialization of these functions. Gellner (1973) has characterized nonliterate or "Savage" uses of language in precisely these items:

> It is the essence of the Savage mind, as of Savage institutions, that there is a lower degree of functional specificity. . . . The enchanted (Savage) vision works through the systematic conflation of descriptive, evaluative, identificating, status-conferring, etc. roles of language. (p. 174)

The Modern mind, on the other hand, differentiates the functions of language and specializes the language to serve one or more of those functions more effectively. Horton (1970) puts it this way:

> One theory is judged better than another with explicit reference to its efficacy in explanation and prediction. And as these ends become more clearly defined, it gets increasingly evident that no other ends are compatible with them. People come to see that if ideas are to be used as efficient tools of explanation and prediction, they must not be allowed to become tools of anything else. (p. 161)

With Gellner and Horton, I suggest that the Modern mind is characterized by the differentiation and specialization of two primary language functions, the *logical* and the *interpersonal*. Although adult language simultaneously serves a number of functions including those of regulating social interaction and making true descriptions, ordinary oral language is primarily interpersonally biased in that it is directed to a particular individual, usually with some intended effect—whether of influencing his or her views, maintaining a certain social relationship, or controlling his or her actions. Furthermore, the availability of immediate feedback permits the continuous monitoring of the listener to determine if the utterance needs to be modified, expanded, tempered, or the like to achieve the intended effect. Hence the rhetorical function is predominant over the logical function: if you fail to maintain an appropriate interpersonal relationship, the conversation simply terminates. This primacy of the interpersonal function appears to be true of all *oral* conversational language whether nonliterate (Goody, 1975) or literate. To illustrate: in ordinary oral conversational language, "truths" must be not merely correct, but socially or practically useful or *relevant*.

I have recently argued (Olson, 1977) that one of the effects of a literate culture generally, and of schooling in particular, is that "schooled" language reflects the formal language of written texts. It involves what Greenfield (1972) called "speaking a written language" (p. 169). Written language has the effect of distancing the speaker from the listener with the result that the rhetorical or interpersonal functions of language become somewhat secondary to the ideational or logical functions. Textbooks, the most characteristic representatives of formal language, are particularly striking for their anonymity. It is not clear who is speaking or to whom the information is being addressed. Texts are an attempt at a simple, impersonal, autonomous, objective, true description. A textbook is not merely the author's opinion of a state of affairs, but rather an expression of what the society takes as "known." The primary difference, I suggest, between the oral conversational language of the child and the written texts of the school lies in the differentiation and realignment of the interpersonal functions and the ideational functions of language.

There are good reasons why the ideational functions of language are progressively turned over to written language. As was mentioned above, writing distances the speaker from the hearer in a way that decreases the urgency of the interpersonal component. Beyond that, the presence of a permanent artifact, the written record, permits the repeated scrutiny of what was actually said in a way that makes it much easier to check the truth and validity of the statements than would be the case with ordinary oral language. Written language, by virtue of the facts that it is explicit, that it is relatively free of the effects of context, and that it stands as a permanent artifact with meanings enduring over time, is substantially different from typical oral speech. Explicitness is partly required because of the loss of certain types of information that would normally be carried by expression, intonation, gestures, and ostensive factors. Ambiguity at any level—graphemic, lexical, or grammatical—is to be avoided.

An illustration of the relative explicitness of written language is taken from Lyons (1969, p. 40) who pointed out that a large number of homophones in spoken language are unambiguous when written. There are, for example, many such sentences that are ambiguous when spoken, but perfectly clear when written: "cf., *il vient toujours à sept heures, il vient toujours à cette heure;* he always comes at seven o'clock, he always comes at this time" (p. 41). Moreover, text must be written in such a way that the "meaning" is unchanged if read in a different context than that in which it was written. That is, since written materials are ordinarily portable and preserved over time, the writer must use language in such a way as to permit the text to preserve its meaning across space and time. Children's linguistic development in the school years can be described, at least in part, in terms of the child's mastery of those specialized forms of language. It is a development from "utterance" to "text."

Linguistic Symbols Specialized for Aesthetic Functions

As Gellner and Horton pointed out, the specialization of language to make it an effective tool for the achievement of certain goals makes it useless or inappropriate for other goals. If explicit prose is to serve the logical functions of explanation and prediction, then the interpersonal considerations, such as the authority of the speaker and the particular requirements of the listener, are to be minimized as are any symptoms of the aesthetic (Frye, 1963, p. 59). Such language is antithetical to both contextualized conversational speech and the poetic use of language.

Consider the problem of ambiguity. While prose text seeks to make meanings completely explicit and unambiguous, poetry, according to many theorists, frequently involves the "packing" of several layers of meaning into a single expression. Empson (1930) in his *Seven Types of Ambiguity* claimed that poetry involves ambiguity but that the ambiguity is intentional and completely controlled by the poet. Along similar lines, Charles Rycroft has suggested:

> Unlike factual statements like "The Battle of Waterloo took place on June 8, 1815" or "Arsenic is a poison" which have only one meaning, poems, novels and dreams either have no meaning or several meanings. Once one has recognized or decided that they have meaning, they become open to interpretation. *(New York Review of Books,* April 3, 1975)

In his *Structuralist Poetics,* Culler (1975) argues that a poet does not so much specify or encode a meaning as create a space into which readers can insert their own meaning: "Poetry offers the best example of a series of signifiers whose signified is an empty but circumscribed space that can be filled in various ways. . . . The same is true of ordinary language. . ." (p. 19). This richness of meaning in poetic language, which N. Goodman (1975, p. 17) calls repleteness, makes that language appropriate for the arts but inappropriate for the sciences and philosophy. Again, we are left with the view that the functions of language are progressively differentiated to serve the arts and the sciences while they remain relatively undifferentiated in ordinary language.

There is a long historical controversy as to whether the specialization of language resulted in the evolution of higher forms of language and thought, or whether that specialization was essentially destructive. Beginning with Plato, who, according to Havelock (1963), was among the first to rely upon an essentially literate mode of thought, poetic language was regarded with suspicion: poets were to be banned from Plato's Republic.

The positivist tradition, beginning with Locke's *Essay Concerning Human Understanding* (1690/1961), involved the movement towards "plain language." Locke's attack on the abuses of language, such as the use of "figurative language," would include much of literature and almost all poetry. For Locke, "eloquence, like the fair sex" involves a pleasurable deceit (Locke, Book III, Chapter 10, Sections xxxiii-xxxiv). Following Locke's lead, the members of the Royal Society of London of 1662 took as their primary concerns the advancement of natural knowledge and the advancement of English as an instrument of prose. According to their historian Sprat, they advocated a "mathematical plainness of style" and a rejection of "all amplifications, digressions and swellings of style" (1667/1966, p. 56). That is, they abandoned rhetoric, the interpersonal function of language, because they believed it to be misleading. The Lockean stance on language remains predominant in society in general and in the schools in particular.

Apologists for literature, on the other hand, have viewed this specialization as devolution rather than evolution (P. Goodman, 1971, p. 229). I shall cite a few examples.

In his *Defense of Poesy*, Sidney (see P. Goodman, p. 229) argued that theoretical sciences are ineffectual. Only eloquence is true, for eloquence may move people to correct actions, and truth resides in right actions not in propositions. Cicero, the orator, made the same arguments about the priority of rhetoric to "mere" truth (Seigel, 1968).

Shelley, in his *Defense of Poetry* takes a similar view. He traced the fragmented world of his time to the positivist attitude to language; only poetry can bring those fragmented parts together:

> A man, to be greatly good, must imagine intensely and comprehensively. . . . Poetry enlarges the circumference of the imagination by replenishing it with thoughts of every new delight, which have power of attracting and assimilating to their own nature all other thoughts.
>
> The cultivation of those sciences which enlarged the limits of the empire of man over the external world has, for want of the poetical faculty, proportionately circumscribed those of the internal world. . . . (cited in Goodman, 1971, p. 229)

To emphasize the significance of the poets in the culture, Shelley concludes with the epigram: "Poets are the unacknowledged legislators of the world."

Matthew Arnold can be put among those who considered the predominance of the language of science as devolution rather than evolution. To cite Goodman (1971):

> Arnold is explicitly drawing on the Wordsworthian doctrine that uncorrupted common speech, heightened by passion and imagi-

> nation, binds man together, whereas utilitarian speech . . . destroys humanity. (p. 230)

Finally Martin Buber's *I and Thou* pursues relief from objective, depersonalized modern society in interpersonal relations, in dialogue, and in the orally shared tradition.

Frye in *The Educated Imagination* and P. Goodman in his *Defense of Poetry* find validity in both these distinctive forms of language, the one more specialized for description and explanation, the other for imaginative functions:

> But the broader function of literary language, including poetry, also remains indispensible, because we are never exempt from having to cope with the world existentially, morally and philosophically; and there is always emerging novelty that calls for imagination and poetry. (Goodman, 1971, p. 231)

Both the devolutionists and the evolutionists agree, then, that a differentiation of functions and a specialization of language to serve those functions has occurred. These primary functions I have characterized as the interpersonal or rhetorical function and the logical or truth function. In addition to these two primary functions, I now wish to consider a third, the aesthetic function.

Recall that the attempt to differentiate the functions of language was unsuccessful as long as it was based on the assumption that some utterances would fall exclusively into one category or another. There is no firm borderline. The solution is to note that any sentence may simultaneously serve multiple functions. Specifically in Austin's (1962) analysis, a sentence is simultaneously a locutionary act (an utterance with a particular semantic or logical form) and an illocutionary act (an utterance representing the intentions and purposes of the speaker). N. Goodman (1975) has arrived at a similar formulation in regard to art by revising the question "What is art?" to "When is art?"

I am suggesting, then, that we may examine any symbolic structure in terms of the three sets of criteria discussed above and outlined here: (1) What effect does the author/artist wish to produce on the listener (what I have called the interpersonal/rhetorical function); (2) What does the symbolic structure in fact state, express, represent, exemplify (what I have called the logical/ideational function); and (3) What is the aesthetic effect upon the listener or viewer (what may be called the aesthetic function).

The status of aesthetics as a function of language, however, is problematic. When we discuss language, it becomes obvious that linguistic art is not something totally different from either ordinary speech or scientific descriptions. All of these uses of language involve the same symbolic code, but the functions to which the code has been applied are quite different. Art, then, is not necessarily distinctive in the symbols it employs, but in the ways those symbols are utilized. A statement may, for example, be both theoretically valid and aesthetically pleasing. This was more obviously the case before the development of the highly differentiated language systems we currently employ. We can hardly imagine Einstein formulating his laws in couplets! Yet in the eighteenth century, that was exactly what Pope did in his *Essay on Criticism*, which to our surprise bears little structural similarity to Locke's essay but consists of an extended poem including this famous theoretical statement:

> True wit is nature to advantage dress'd
> What oft was tho't but ne'er so well express'd.
> (Pope, 1711, II, 256)

In Pope's essay, you can examine either the validity of the claim, or the structure of the rhyme and meter, or both. The poem is simultaneously specialized to serve both explanatory or logical functions and aesthetic ones.

Even prose specialized to serve a particular function may be evaluated in terms of the validity of the propositions it expresses or in terms of the quality of expression. According to many writers (Frye, 1971, for one), Darwin's prose is exemplary. An evaluation of the content and the art of Darwin's writing does not reflect different objects; rather, it sets up different criteria against which a single object, in this case a verbal object, may be evaluated. Again the question is, as N. Goodman suggested, "When is art?" rather than "What is art?" Symbols that are specialized to serve a predominant function, for example a prose essay, are usually more appropriately criticized or evaluated in terms of their intended functions rather than any others. Nonetheless, any work can simultaneously serve many functions, and a work intended for one function may be criticized in terms of other functions.

What can we say of the aesthetic function relative to the other functions of symbols? The rhetorical and logical functions can be fairly well disentangled in regard to language. The aesthetic function remains problematic: it is not simply independent of the other functions of symbols, but it is a set of relations that hold within, between, and among other criteria. Here I have very little to go on.

One way to state the question is to ask whether beauty, like happiness, can be pursued directly or whether they both reflect the integration or alignment or effectiveness of a symbol in achieving one or more of the other functions. To borrow a phrase, "Is truth beauty?" Can symbols be specialized to serve purely and exclusively an aesthetic function? Or, does the aesthetic lie in simultaneously and effectively serving one or more functions? If we take N. Goodman's concept of "repleteness" seriously, we would seem to be pushed towards the latter conception. How else could we detect repleteness in those symbol systems that are specialized for aesthetic function, namely the arts?

The aesthetic function often seems to involve an aspect of symbols that we have not, thus far, considered. Language possesses not only a semantic or meaning structure but also a sound or surface structure consisting of its phonology as well as its prosodic features including intonation, stress, rhyme, and meter. As I have pointed out, language specialized for the logical functions emphasizes the lexical, grammatical, and logical structure of the language, while the sound structure is treated as completely transparent and uninteresting. A masterful use of the surface structure, however, as in Darwin's *On the Origin of Species*, can be judged on aesthetic criteria, even though the book would not ordinarily be called art.

The judgment or evaluation of a book on aesthetic criteria, or in terms of the aesthetic function, requires analysis not only of the logical form of the argument presented but also of the ways in which the sound or surface structure of the language contributes to or is congruent with or is replete with the logical structure. The emphasis is on whether or not specific features of the means of expression can account for the effectiveness of the ideas.

In the forms of linguistic expression that are generally referred to as *the arts*, reliance upon the sound structure becomes more obvious. The features of phonology, syllabication, and prosody may be given some prominence in rhyme and rhythm, but the sound structure has to be congruent with the meaning or images expressed. Once more, then, the art is characterized by repleteness. The repleteness is achieved by making the writer or reader aware of language's "duality of patterning" (Hockett, 1968) at the levels of sound and meaning and then by making the two patterns interact in some effective way. In Pope's words, "The sound must seem an Echo to the sense" (II, 365).

Even further along this line of thinking is Gide's advice to young poets to follow the rhyme not the thought—that is, get the rhyme right, let the meaning take care of itself, and possibly invent a new meaning. Jakobsen (1960) also talks of poetic language as "language which calls attention to itself."

The Specialization of Symbols in the Non-Linguistic Arts

Let us now apply this line of argument to the visual arts. The ordinary function of illustrations or drawings and so on is to convey information, to depict objects or events. That is, drawings may primarily serve some informational or logical functions, albeit in a way somewhat different from linguistic symbols. And, as I pointed out, all symbols may be used as "exploratory devices" for the elaboration and explication of a child's knowledge of the world. But pictures like language may have another function. When we view a picture of a cat, we are ordinarily quite unaware of the ways in which the lines and patches of color give rise to the perception of the cat. In more theoretical terms, the structural descriptions underlying object perception are not themselves subject to awareness. That is, we may know that an *a* is an *a* or that "This is a picture of a cat," and yet we may not know the features by which we recognized it as such.

The process of perceiving objects by means of visual information of which we remain largely unaware is typical of our ordinary, everyday experience. This bias to object perception is characteristic not only of children (see Gardner, 1977) but also of adults who have had little exposure to the arts. As numerous critics have pointed out, many adults on seeing a picture will pay little attention to the form of representation but will simply look at the caption, and then they will decide if the picture is a correct representation of the event it describes.

A picture becomes art, that is, a picture is judged against aesthetic criteria, only when it is perceived in terms of more than one set of criteria, only when it is replete. In the case of the picture of the cat, the repleteness comes not merely from perceiving the drawing as representing a cat but from perceiving the drawing in terms of the surface structures, the forms, the lines, and the colors that together give the appearance of the cat. It is the development of the ability to perceive simultaneously the object *and* its appearance, form, color, and so on that is the beginnings of artistic or aesthetic perception.

Arnheim (1974) was the first to raise this point. To account for the difficulty children had in drawing or copying the shapes of objects and other visual displays, which they could perfectly well recognize, Arnheim (1968, 1974) wrote:

> Tentatively I would suggest that the incapacity exists because perception is not primarily the apprehension of shapes or colors. Rather, to perceive is mainly to receive the expressive or dynamic effects of shapes and colors. Early experiments of mine have taught me that when the average person looks, say, at a human face he sees its tenseness or plumpness or slyness or its harmony [or who it is] rather than the shapes and colors producing that effect. Apprehension of shapes as shapes and colors as colors does exist, of course, but its level of discernment develops gradually from the simple to the complex.
>
> The difference, then, is . . . between perception of effect and perception of form, the latter being needed for representation. (Arnheim, 1968, p. 206)

In general, representational systems such as language may have the effect of focusing attention on—of making explicit—certain aspects of the structural descriptions of objects that until then were known only implicitly. It is only with the construction of an explicit representational system for the properties or features of an object's structural description that we can properly talk of the perception of "appearances" or of forms, colors, and so on (Olson and Bialystok, in preparation).

In the arts, the difference between objects and forms is sometimes discussed as the relation between form and function. At times, the attempt is to develop a form as a design that visually suggests its function: the appearance of the chair lets you know it is to be sat on. At other times, as in the paintings of Ben Nicholson, the attempt is to split the form from the function to make the form the subject of perception in its own right. In both cases, however, the viewer is led to perceive two levels of structure—the level of objects and the level of appearances (colors and shapes)—to evaluate them separately, and on occasion, to detect their correspondence, that is, their repleteness.

It is perhaps the case that repleteness may be detected within the surface structure, that is, within the properties of the appearances themselves—for example, between line and color—rather than between an aspect of the object's appearance and its meaning as a whole. Furthermore, it may be noted that the arts specialize in manipulating the surface structure of the representations more than the semantic or the logical aspects of the representation. Gardner (1977, p. 112) has emphasized that the artist functions within a particular sense modality, that is, with the aspects of a symbol that can be detected by a single modality—with the sounds of language, the forms and colors of the visual arts, and so on. McLuhan (1964) has also suggested that the arts are efforts at specializing the senses.

In addition to language and drawings, we may also note the differentiation and specialization of the functions of symbols by considering in a preliminary way some aspects of music, dance, and architecture. The possibility of non-differentiation of function is illustrated by the fact that music is occasionally regarded—as it was by the ancient Hebrews—primarily as song, as a means of sustaining formalized patterns of speech. Words so formalized into song often represent socially significant truths, such as we still hear in national anthems, hymns, and folk songs of various sorts. The music was a means of preserving important words, and the predominant form of the music was a tune that honors the structure of speech: one can either sing or hum along with it. Thus, David's *Psalms*, which we regard as verses, were sacred songs or hymns; the word "psalm" derives from the Greek *psalmos*, which means to twitch with the fingers, as in playing a harp. The words of the psalms were important, the tune made the words memorable, and playing the instrument either facilitated the singing of the words or, if played alone, served to retrieve the words that went with the music. Music therefore served a social function. To have mere music, that is, music detached from and independent of meaning, was anathema to the Hebrews: "Woe to them that . . . sing idle songs to the sound of the viol; that invent for themselves instruments of music" (Amos 6:5).

The specialization of music independent of words or songs was greatly expanded in modern times. Thus Bach used music primarily as a means of expressing important cognitions or beliefs. The rapid specialization of purely instrumental music—as in symphonies, for example—coincided with the Romantic period which, according to Ong (1971), was set in motion by the Encyclopedists who were responsible for storing the important cultural information in printed form so that the preservation of that information was no longer tied to music, song, and poetry. Freed from the responsibility of preserving important cultural meanings or "truths," poetry in the Romantic era specialized in originality, and music specialized in "composition"—in creating sound structures which are pleasant and original but which, often, cannot be sung or danced to.

Stalin (according to Frye) disliked most modern composers because he could not sing the tunes after having heard them, while he liked Tchaikovsky because he could. In other words, he opposed the specialization of music independent of song. The necessity of producing song, of course, puts an immense restriction on musical composition.

A similar differentiation and specialization may be seen in ballet. Lawrence O'Toole, a Toronto critic who reviewed the Shanghai Ballet, was disturbed by what he perceived as a high degree of embedded propaganda. He wrote:

> When does a ballet step cease to be a ballet step? Probably when it's no longer there for the sake of itself.
>
> Someday capitalism might come to realize that the art it has produced is its most profound metaphor, its reason for being. Things for the sake of themselves. A pas de deux danced simply because it is beautiful to look at. (*The Globe and Mail*, Toronto, May 30, 1977)

His criticism was that ballet should be performed for its own sake. For the Chinese that specialization would be mere bourgeois decadence: according to them, ballet which serves no social function is not art at all.

The differentiation or non-differentiation of symbols or functions of symbols is apparent in the preceding examples. The specialization of the arts results, as O'Toole stated, in art for its own sake. But the artistic production and the creation of the art form, whether or not they are engaged in for their own sake, require the simultaneous awareness of both the meanings of the forms and the appearances, of both the surface structures of the dance itself and their correspondences. To view the dance simply in terms of its meanings without an awareness of the forms that are manipulated to produce those meanings would succeed as communication but would fail as art. To make us simultaneously aware of both meanings and forms would at least indicate art, even if that art is not as specialized as Western art.

A final illustration of the differentiation and specialization of the pragmatic and the aesthetic functions comes from architecture. In *Towards a New Architecture*, Le Corbusier (as cited in Choay, 1960) describes his process of extending both of these concerns. First, he says, he emphasized the functional aspects of design: "I had given the house its fundamental importance calling it 'a machine to live with'." Later, he reversed himself, minimizing functional criteria and strongly pursuing aesthetic criteria: "Architecture is the masterly, correct and magnificent plays of the forms in the light" (Choay, 1960). In this way, architecture becomes art when its primary concern is with the appearances or forms of the constructed objects as opposed to their categorical or functional qualities.

An extreme concern with the aesthetic function, however, may interfere with the utilitarian and social functions of architecture. A guest in the Philip Johnson glass-box house—which looks more like a sculpture nestled in a hillside than a dwelling—tells of casually dropping her handbag on a chaise longue designed by Mies van der Rohe. The hostess "quickly corrected her, whispering that one does not have extraneous objects lying about in the glass house. The interior is a still-life" (Tomkins, 1977).

The differentiation of the functional and the aesthetic, and the consequences of pursuing one without regard to the other were advanced in general terms by Ruskin (1907) in his discussion of Gothic architecture. In the following discussion of color, he carefully differentiates the independence of the two criteria we have discussed—the surface structure properties of the medium, and the meanings and uses to which those constructions may be put:

> We are to remember, in the first place, that the arrangement of colours and lines is an art analogous to the composition of music, and entirely independent of the representation of facts. Good colouring does not necessarily convey the image of anything but itself. It consists in certain proportions and arrangements of rays of light, but not in likeness to anything. A few touches of certain greys and purples laid by a master's hand on white paper, will be good colouring; as more touches are added beside them, we may find out that they were intended to represent a dove's neck, and we may praise, as the drawing advances, the perfect imitation of the dove's neck. But the good colouring does not consist in that imitation, but in the abstract qualities and relations of the grey and purple. (XLII, pp. 166-7)

Having differentiated the properties of the compositions from the objects or events that those properties may be used to represent, Ruskin raises the question of art. For him, art is the convergence of surface properties (the colors and the lines) with the meanings or uses of those representations; art is the convergence of the forms with the functions:

> Now the noblest art is an exact unison of the abstract value, with the imitative power, of forms and colours. It is the noblest composition, used to express the noblest facts. (XLIII, p. 167)

At times, Ruskin notes, the two sets of considerations must be differentiated to serve different functions:

> . . . the best art is not always wanted. Facts are often wanted without art, as in a geological diagram; and art often without facts, as in the design of a Turkish carpet. And most men have been made capable of giving either one or the other, but not both; only one or two, the very highest can give both. (XLIV, p. 167)

To summarize: I have discussed symbols in terms of the variety of functions they can serve. Any symbol can be judged against pragmatic, social, logical, and aesthetic criteria. But symbols and artifacts may also be specialized to serve one or another of these functions to the exclusion of the others. Thus Locke thought that singling out the logical aspects of language made it a powerful tool of truth and that eloquence or rhetoric was a deceit. Orators and politicians, at least according to such eminent spokesmen as Cicero and Matthew Arnold, claimed that language that was restricted to true scientific descriptions but failed to move us to proper actions was useless. They would say that socially significant ideas had to be expressed in the most powerful form available, that is, these ideas had to exploit all of the linguistic devices available for their expression.

I have tried to indicate that several of the arts—drawing, music, ballet, and architecture as well as language—share the important tradition of tying the symbolic form, what I have called surface structures or forms or appearances, to important social and pragmatic functions. Repleteness is developed by the construction of two or more levels of structure both of which become apparent to the consciousness of the viewer or listener and which enhance or otherwise interact with each other.

The second important tradition of the function of symbols in the arts is the increasing specialization of the aesthetic function which minimizes the pragmatic and social functions and thereby relaxes the constraints they impose on the imagination. The result is an increase in the originality, and perhaps in the quality, of art and, often, a decrease in its social relevance and utility.

Education and the Arts

As I have pointed out, symbols serve cognition in three major ways. The first two—the use of symbols as devices for exploring reality and for permitting distinctive forms of thought—have little to do with the arts but a great deal to do with knowing and thinking.[2] These two functions tend to be well represented already in ordinary schooling. That is, there is a reasonable emphasis on symbolic representations of various sorts, including speech, writing, mathematics, cartography, and so on. There is less realization that these symbolic systems serve not only as ways of representing knowledge, but also as *modes of thought* that are fostered and developed only by the frequent and wide application of symbols to a variety of problems. There is perhaps an overemphasis in schooling on verbal symbols and a relative neglect of nonlinguistic symbols, and within the treatment of verbal symbols, a relative neglect of nonprose forms.

The third primary way that symbols serve cognition is through the arts. The arts, we have seen, can operate upon symbols in at least two ways. Most generally, the arts facilitate, permit, or encourage the application of a certain set of criteria—what I have referred to as aesthetic criteria—to any symbolic expression. Just as linguistic symbols may be criticized in terms of their effectiveness in achieving rhetorical functions, or in terms of their effectiveness in achieving logical-truth functions, so too they may be evaluated in terms of their effectiveness in achieving aesthetic functions. In the case of unspecialized symbols, however, the aesthetic criteria have to do with the repleteness operating between the surface structure and the semantic structure—with how "the sound reflects the sense." In more specialized symbols (such as those without a semantic structure), the aesthetic criteria appear to involve repleteness within the surface structure properties themselves.

Secondly, the arts elaborate and specialize symbolic systems by focusing upon the surface structure properties of the medium in question. As a consequence, we come to know a great deal more about the sound properties of language, or the visual properties of light and paint, or the kinds of effects that may be achieved by operating with those properties as a result of our participation in the arts either as producers or as audience.

An education in the arts, therefore, may be expected to expand a child's cognitive skills in both of these ways. First, the child can come to an awareness of the presence of aesthetic qualities in a verbal or written expression in addition to its other functions.

It is possible, however, that there is nothing special about an aesthetic criterion except that it demands a simultaneous consciousness of more than one level of structure—in the case of a verbal expression, a consciousness of the surface structure of the symbolic expression along with its semantic or meaning structures. Children may implicitly know the features of surface structure in the same way that they rely on them in ordinary perception. Hence, they appreciate poems, nursery rhymes, or narratives, but they are not consciously aware of their surface structure properties per se nor are they aware of how these surface properties enhance the meaning properties of the stories. Consequently, children may not fully appreciate the subtlety that went into the artist's production. Children's encounters with art and, particularly, their attempts at art, therefore develop their sensitivity to both levels of structure.

The second effect of an education in the arts on a child's cognitive skills is the development not only of an awareness of the symbolic forms, but also of a conscious, explicit knowledge of the structure of sound and of appearances, such that the child can manipulate those appearances to achieve particular effects. As long as the child's knowledge of these features of symbols is only implicit, they remain inaccessible and out of the user's control. It is only with a fully explicit knowledge of the surface structure of symbols that the child can consciously and effectively use them for communicative and cognitive purposes.

It is clear that the specialization of the aesthetic function—generally, a conscious awareness of the different levels of structure of the symbol system—is in part responsible for the elaboration of the two non-art or non-aesthetic functions I discussed at the outset. Symbols, I suggested, serve both as means of exploring reality and as forms or modes of thought by being completely transparent to the semantic and logical structures they represent or exemplify. But if we remain unaware of those properties and their effects on meaning, how are we to specialize those surface structure properties to enhance their transparency?

Effective control of these properties in relation to their meanings—whether to make the symbol transparent to its meanings to fulfill most informative purposes, or to make the symbol call attention to itself to fulfill most artistic purposes—depends on an awareness of the surface structure properties of the symbol system. It is the arts that are largely responsible for bringing into consciousness a fully explicit knowledge of the various levels of structure, that is, the arts are responsible for making explicit our knowledge of such things as the structure of sound or light, and the structure of meanings represented or exemplified. When this knowledge is explicit and conscious, then the child and the adult can effectively use symbols as instruments of discovery, of thought, and of delight.

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NOTES

[1] When I talk of symbol systems and the manipulation of symbols, I am in this case referring to the meanings of the symbols and not merely to their external forms. Thus in dealing with oppositions in ordinary language, I refer to the meanings of the words and not to the words themselves.

[2] As Vernon Howard points out in his discussion, this way of putting this point is somewhat misleading in that it implies that the arts are not ways of knowing and thinking, whereas it should be clear that I think they are alternative ways of knowing and thinking.

Vernon A. Howard / *A Response to Olson*

Remarks on "The Arts as Basic Skills: Three Cognitive Functions of Symbols"

Mr. Olson has written ably and interestingly of the varieties of function symbols may serve: rhetorical, logical, aesthetic; and in particular, of how the latter function may combine the others or, as in art for art's sake, may be pursued like the others for its own sake. Both as a compliment and complement to his paper, I should like to discuss briefly and very generally the logical notion of a symbol function—of what it is to be a symbol of a certain kind—paying special attention to the actual and potential contribution of semiotics to psychology.

1. Three Perspectives on Symbolism

It is customary amongst humanists and social scientists to label as "symbolic" virtually any object, action, or event that is not just being itself, which is to say, being literal or perhaps just literally being. Myths, for instance, are said to have literal, exoteric significance for those who take them at face value but only symbolic, esoteric significance, if that, for those who take them to be myths (Bidney, 1953, p. 302). And if symbolic status is supposed to mark a sophisticated understanding of myth, precisely the opposite flight from symbolism to literal formalism is thought to evidence an aesthetically enlightened attitude towards art. Between symbolic myths and nonsymbolic art lies a confusion, more exactly an ambiguity, in our common notion of symbolism that leads me to question the twin assumptions that art, myth, or anything else is less symbolic for being literal or exoteric and more symbolic when esoteric, allegorical, or metaphoric.

On the one hand, there is a broad usage of the term "symbolic" as roughly synonymous with anything that carries meaning in any of a variety of ways: literal or metaphoric descriptions; expressive or deadpan portraits and gestures; simple or complex codes; straightforward, ironic, or allegorical narratives; traffic signs; and silhouettes on lavatory doors. On the other hand, a much narrower usage of "symbolic" tends to restrict the term to whatever wears its meaning up rather than

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on its sleeve, to the metaphorical and allegorical, the hidden, latent, deeper, more general, and recondite. Thus *Moby Dick* read as a simple sea story is "symbolic" on the former usage but not on the latter, a difference that would hardly matter if it were not for the fact that in any view, language—particularly complex, descriptive language—must be placed very near if not at the apex of human symbolic development. By the same token so must number systems, pictures, codes, music notations, diagrams, and maps, all of which amounts to a special plea for the broader usage for theoretical purposes with the proviso that something need be done to distinguish among the various types of symbols in ordinary and extraordinary use. Little violence is done thereby and some clarity gained, since things classed on the broader usage as "symbolic" turn out on the narrower usage to be symbols of symbols: a whale description expressing Evil; a fish depiction representing Jesus; an odyssey narrative exemplifying heroism, endurance, or human frailty. The task then is to give an account of these various "simple" and compounded symbolic functions—of description, depiction, representation, expression, exemplification, and the like.

Some progress has been made in this direction in recent years which Mr. Olson has brought to bear on the topic of cognition and basic skills. In that connection, it is useful to distinguish three perspectives on the study of symbols, the first two of which reflect the aforementioned ambiguity in our common view of symbolism. First and more closely allied to the narrow usage is what might be called the *interpretative* perspective. The question here is what does a particular symbol or collection of symbols mean: their "levels" of meaning, specific and general, literal and metaphorical; their diachronic history; and, where appropriate, their ethnographic variations. The quest for the meaning of symbols may range from learning to use a particular form of symbolization, say, language or music notation, to questions of style in art, or of the nature of artistic, scientific, historical, or religious understanding. Included under this heading would be aspects of the work of lexicographers, art critics, cultural anthropologists, epistemotogists, and historians, but foremost and most obviously, the efforts of ordinary people to understand and communicate about their world.

Corresponding to the broader colloquial view of symbolism is what I shall call the *functional* perspective. It concerns how particular items—gestures, utterances, inscriptions, objects—acquire their symbolic functions to describe, name, depict, express, and so forth. Put another way, what are the relations that sustain a particular symbolic function and its contribution to meaning? Answering that question and propounding a general theory of symbols is the prime task of semiotics, but it is also of interest to logicians, linguists, and philosophers.

Beyond these perspectives on the study of symbols is the *cognitive* perspective which is concerned with the role of symbols in the growth of knowledge and perception in the individual. It is concerned with answers to such questions as: How do symbols of various kinds mediate perception and thought? Do symbols emerge in regular sequences and through some sensory channels rather than others? In short, what are the psychological processes required or most frequently involved in the acquisition and mature use of different sorts of symbols? Such matters are fundamental to any theory of instruction and constitutive of theories of learning: they thus occupy educators and psychologists alike.

Clearly, the aforenamed perspectives are complementary and, to a degree, intersecting rather than exclusive realms of inquiry. Which is to say that it is as fruitful to distinguish what something means from how it means from how we learn what it means as it is folly to separate these three perspectives as realms of inquiry. Indeed, in what follows I am concerned with the role of symbols in cognitive theory from a functional point of view; that is, with the contribution of a theory of symbols to a theory of cognition.

2. Meaning, Function, and Cognition

As the whole of Mr. Olson's paper reminds us, talk of intellectual growth is talk about the growth of meaning in general, not just as it pertains to language but as it pertains to whatever enables us to understand and to make our way in the world. Hence, talk of meaning inevitably involves a consideration of the mediating power of symbols as instruments primarily of cognition and secondarily of communication. This is not to underrate the importance of communication for cognitive growth but rather to underscore symbolization's logically prior purpose of facilitating understanding in the widest sense of the term. Without understanding, communication not only would fail, there would be no need of it.

I am suggesting we approach the concept of meaning in this context in terms of symbol functions. Unlike the "meaning is use" formula, until recently so fashionable in philosophical circles, the notion of a symbol function assumes neither that all meaning is linguistic nor that it is initially clear what it is for something to be "used" or to function as a symbol of a certain kind. On the contrary, it is the *aim* of a general theory of symbols (or semiotics) to determine the conditions under which something—for instance, two contiguous circles—may function as a symbol of a certain sort—as two letter *O*'s, two zeros, or Little Orphan Annie's eyes. While linguistics has made brisk progress along these lines towards illuminating the structures and functions of language, our theoretical grasp of the nonlanguages remains most tentative and unsure. The weakness reaches into other fields.

Cognitive psychologists generally, and Bruner in particular, have been criticized for reinstating an out-moded "theory of ideas" in their reliance upon images, icons, maps, pictures, schemas, and other so-called "inner representations" to explain behavior they would otherwise consider inscrutable (Schwartz, 1968). The charge is that to explain one inscrutable by another is not only to beg the question but, even worse, to put it beyond experimental access. To that extent, a picture or image in the head is theoretically more troublesome than a pain in the neck. The latter at least has spatiotemporal locale, perceptible quality, and measurable intensity.

The irony is that we are not much better off with a picture in the hand. The situation is not unlike the philosopher's joke that goes, "What is time?" (Pause) "That is time!" For a picture is more than mere pigments on canvas, just as language is more than uttered vocables, or numbers a set of numerals. Exactly what more is not likely to be found by closer inspection of whatever things have pictorial, linguistic, or numerical status, nor by identification of their referents (since there will often be none), nor in any of the special relations of similarity, contiguity, causality, or conventionality supposedly held between certain kinds of symbols and their referents. Rather, we are in the position of having to take all such symbol "vehicles," their referents (if any), and special relations to them as so many phenomena to be explained. For that, no mere taxonomy based on these phenomena will do; for what is there to indicate when two things that are similar, contiguous, or causally related are also (or therefore) symbolically related? Does a hammer necessarily symbolize every other hammer, or the hand that holds it, or the nail it drives? One supposes that it could "by convention," but that suggestion comes uncomfortably close to a *petitio principii* when left to rest there.

To be adequate a theory of symbols must explain the aforementioned phenomena by explicating the relationships of reference, of formation, and of structure that sustain the pictorial, linguistic, or numerical functions. On the analogy of logical, notational, and other sorts of *systems* of symbols, a theory of symbols endeavors to bring all types of symbol systems within a common comparative perspective. (Further details of symbol systems will come to light as the discussion proceeds.) For the moment, it suffices to say that if the aim is to facilitate a broad theory of cognitive growth—of, say, Brunerian or Piagetian proportions—then what is required is an equally broad though rigorous theory of symbols encompassing the whole range of symbol systems in everyday and specialized uses that will serve as armamentary and desideratum for further empirical theorizing about their acquisition, development, and influence on cognition.

A major advantage of the functional approach is that it avoids the fallacy of "psychologism," which ironically afflicts certain areas of psychology more than linguistics or philosophy. That is the tendency to view meaning as a mental process or event such that the meaning of a symbol is taken to exist temporally "in the mind." As already mentioned, the reification in the mind of various schemas, images, and the like has not gone unnoticed by critics of cognitive psychology.

The tendency to psychologism is perhaps natural enough. When we read, for example, we understand what we read, and the process of understanding may well consist of a series of conscious states. But to leap from that observation to the conclusion that the meaning understood is a mental event is to confuse acts of understanding with the meaning understood. The same point can be made about knowledge in general which, no less than meaning, is irreducible to peculiar mental states dredged up by an effort of introspection. If meaning were a mental event, it would exist only so long as those events, and it would vary from one individual to another with each different state of consciousness evoked by a symbol, and from one occasion to another for the same individual. It would then be impossible to speak of words, sentences, or any symbol as having the same meaning for more than one individual on more than one occasion; and with that sacrifice of publicity of meaning would go all possibility of communication as well (Greenlee, 1973, pp. 30-31). The consequences are thus far worse than simple empirical inaccessibility.

Since meaning on the functional approach is not an event, still less a mental event, these consequences are avoided. To inquire how a symbol functions relative to other symbols of that kind in a system of symbols—be it in a word, image, map, or graph—eliminates much, though not all, of the mystery and lack of access that accrues to so-called "inner representations," which difficulties accrue no less, though perhaps less obviously, to symbols outside the head as well.

3. Symbols and Sensibility

Philosophical symbol theorists of whatever persuasion have tended to assume that how a symbol functions (whether to depict, signal, or describe) depends on certain relations between symbol and referent determined by the physical-sensory characteristics of the symbol itself: whether it is similar to its referent (icons), spatially or temporally contiguous (indexes), or conventionally associated to a referent (symbols). (See Peirce, 1902, pp. 274-308.) Accordingly, some kinds of symbols appear to be more "artificial," "conventional," or "abstract," at least in the sense of having fewer roots in direct perception than others, as in the case of mathematics and language versus natural signs (indexes) and pictures. From this perspective flow such familiar dichotomies as those between the verbal and the nonverbal, the verbal and the visual, the discursive and the presentational, the literary and the plastic arts—each as theoretically confusing as initially convenient ways of sorting symbols into types.

Peirce himself humourously confessed to "triadomany" (cited in Greenlee, 1973, p. 34), and once in its thrall, it is difficult to see beyond the layer upon layer of trichotomies superimposed, like so many conceptual epicycles, one upon the other. Stepping back for another look, however, it is clear that even assuming the physical-sensory properties of the symbol vehicle to be constant, the ways of symbolizing are highly variable relative to a given symbol vehicle. "A picture in one system may be a description in another" (Goodman, 1976, p. 226). Or a word like "love" is transformed into sculpture by Robert Indiana. Conversely, there can be many physical-sensory vehicles for a given mode of symbolization. Language is usually visual *and* verbal, and can be, although less commonly, gestural or tactile, and hence, nonverbal—either way giving the lie to our most common categories for separating language from the nonlanguages. And since two- and three-dimensional visual objects, gestures, and sounds may equally represent, any hasty identification of the representational with the visual or pictorial is hasty indeed. It is evident, therefore, that types of symbolization cut across physical and sensory modalities in ways rendering any classification of the former based upon the latter highly suspect. What limitations might then be expected regarding the sorts of things that can be symbolized in certain ways? The answer is virtually none. Though a Tabby-depiction, a Tabby-description, and a Tabby-mime differ amongst themselves in many important ways, they all refer to the same cat. And if, as we must, we allow for expression, then sounds can be pictured, colors sounded, feelings painted, thoughts felt, and the unspeakable rendered in words. It is only some theory that tells us otherwise.

4. Towards an Instruction of Theory

What can be recommended to make the relations between symbols and cognition easier for psychologists of the Brunerian-Olsonian ilk? Mr. Olson's paper leaves no doubt that it is time to cancel the old debt to philosophical semiotics and take out a new loan. Fortunately, some fresh hard currency has come available in Nelson Goodman's *Languages of Art: An Approach to a Theory of Symbols* (1976). Though ostensibly a book in aesthetics, it is first and foremost an attempt to delimit the outlines of a general theory of symbols inclusive of such topics as metaphor, expression, representation, realism, work identity, forgery, the uses of notations in art and science, and analogue and digital systems of measurement. Furthermore, in stressing the function of symbols as instruments primarily of cognition—of understanding and perception—and secondarily of communication, Goodman's approach is well suited to the purposes at hand. Mr. Olson has shown us, amongst other things, some of the profits to be gained from the new semiotics.

Just three quibbles—more queries, really,—deserve mention in closing. Mr. Olson in commenting on how symbols as "exploratory devices . . . require that we pick up new cues or information and as a result elaborate our perceptions of events," goes on to say, "It follows that such symbolic activities as drawing an object, describing an object, or photographing an object require somewhat different information about that *object* (italics mine) than does the physical manipulation of the object." To me, the required "different information" would be about depicting, describing, or photographing; that is to say, about the different symbolic ways of rendering objects, which ways in turn give us new perspectives on objects. What the depicting, describing, and photographing *require* in the way of information differs from the information they *give*. Mr. Olson seems otherwise well aware of this.

Then later Mr. Olson says concerning the distinction between the "logical" and "interpersonal" functions of language that in interpersonal uses "the rhetorical function is predominant over the logical function: if you fail to maintain an appropriate interpersonal relationship, the conversation simply terminates." Well, of course, the interpersonal relationship could be a logical one; and as Socrates, himself a paradigm of logical interpersonal relationships, observed long ago, dialogue ceases where logic fails. Starting from the extremes of the "logical" and the "interpersonal" uses of language, there is perhaps a tendency to view them as mutually exclusive, or nearly so, when in fact they are often different but clearly overlapping emphases of language.

Finally, in a similar vein, Mr. Olson remarks both in his abstract and again when he is discussing education and the arts that the "purely intellectual functions of symbols," those having to do with exploration and thought, "have little to do with the arts but a great deal to do with knowing and thinking." This way of putting the matter slightly undermines Mr. Olson's own case which is precisely that symbols may serve cognition in all three ways simultaneously, particularly in representational art, and even when art exists for its own sake—maybe especially then—when it is required to make so much more of an effort to understand art itself. Surely not all exploration, knowing, and thinking are art (though they do have their aesthetic aspects), but I think Mr. Olson would agree, indeed it is his point, that whatever else they may be, art and the aesthetic are cognitive. That way lies sanity in our knowledge of art at no expense to sensitivity in our appreciation of it.

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Brent Wilson and Marjorie Wilson

Recycling Symbols: A Basic Cognitive Process in the Arts

Introduction

> *The devil* should be the card that, in my profession is most often encountered: is not the raw material of writing all a rising to the surface of hairy claws, cur-like scratching, goat's goring, repressed violences that grope in the darkness? (Calvino, 1976/77, pp. 100, 101)

In Italo Calvino's *Castle of Crossed Destinies*, a group of wayfarers, transient guests seated at supper in the spacious hall of a once elegant castle now transformed into an inn, find themselves bereft of speech. Tormented by their loss, they resort to communicating with the aid of a pack of tarot cards. One by one, the mute storytellers identify themselves with the card that appears to resemble them most, the Knight, the King of Cups, the Page of Swords, and then they proceed to recount their individual tales through intersecting arrangements of the cards. The course of these visual stories would be impossible to follow without the aid of the narrator whose interpretations of the arrangements—or more accurately, whose speculations—are punctuated with such tentative phrases as "surely wishes to tell us," "we have ample time to follow him with our conjectures," and "we hoped these questions would be answered by the following cards."

In Calvino's words: "This book is made first of pictures—the tarot playing cards—and secondly of written words. Through the sequence of the pictures stories are told, which the written word tries to reconstruct and interpret" (p. 123). The tarots are "a machine for constructing stories," through which Calvino was "tempted by the diabolical idea of conjuring up all the stories that could be contained in a tarot deck" (p. 126). Surprisingly, the stories Calvino conjures up are familiar ones: Faust, Parsifal, Hamlet, Macbeth, Lear, Oedipus, and "many

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other famous stories" that Calvino says "appear and disappear among the tarots" (p. 127).

Why was it that the tarots generated "old and famous stories" despite the fact that Calvino imposed upon himself strict rules for patterning the cards?

> In the *Castle*, the tarots that make up each story are arranged in a double file, horizontal or vertical and are crossed by three further double files of tarots (horizontal or vertical) which make up other stories. The result is a general pattern in which you can "read" three stories horizontally and three stories vertically, and in addition, each of the sequences of cards can also be "read" in reverse, as another tale, thus we have a total of twelve stories. (p. 124)

And why is it that in "The Tavern of Crossed Destinies," the second half of *The Castle of Crossed Destinies* which contains stories created with a second tarot pack, Calvino begins by transforming tarots to narratives, but soon returns to describing pictures?

In addition to the tarots, various paintings of Saint George and the Dragon—the Alterdorf in Munich, the Giorgione in London, the Pisanello in Verona, the Ucellos in London and Paris, the Raphael in London—and then a Durer engraving, a Rembrandt drypoint, and a host of paintings of Saint Jerome and the Lion provide the symbols for the writer's own story. It is a tale in which the writer becomes a fusion of monk and beast, lion and dragon, "warrior and sage in everything he does" (p. 111).

In Calvino's narratives as in his methods we have a paradigm of the sources of symbols, of their uses, and of their transformations among the arts. As seen by Calvino, the symbols of the arts have as their roots the symbols of the arts: there is a continuous flow from visual to verbal to visual to verbal. Through his work we can begin to answer the question we have been asked to address in this paper, Are the arts symbolic representation?

In Calvino's writing we can see the same processes as we see in the narrative drawings of young people. At the risk of suffering culture shock as we leap from Calvino's seductively elegant poetry to children's charming picture stories to prosaic psychological explanations, we will enlist Calvino and the children's drawings in the service of explaining the recycling of symbols as a basic cognitive process.

In light of our current state of knowledge, playing in the space between cognitive psychology and the symbolism of the arts is a foolish affair. Psychologists have shown great reluctance to focus on the larger issues of human behavior such as explicating their own psychological theorizing; the thought processes of artists are at least as complex as those of psychologists. Obviously, we will be making some gross leaps back and forth between the arts and psychology; nevertheless, we hope to use current cognitive theories to suggest a tentative explanation of the symbolic processes in the arts.

Symbols of Art and "Reality"

There is a naive but not uncommon belief about the genealogy of a work of art, the assumption being that a work of art starts with some of the materials of life's experiences that are then somewhat simply transformed from life to art. The extent to which this assumption has been made, even by those sophisticated in the making of art, is illustrated by the Renaissance sculptor Cellini. Cellini, claims Scholes (1966),

> no doubt considered the art of his *Autobiography* to reside in life rather than in the telling of it. . . . He conceived of it as a factual account of his complete devotion to art, without reflecting that the principles which govern the construction of an allegorical design in metal might also govern the construction of a confession. (p. 155)

Scholes indicates that Cellini's autobiography is closer to Renaissance fiction than to modern biography inasmuch as it lacks the sense "of personal development, of historical awareness, of self-scrutiny" (p. 154) that we have come to expect from the hero of the modern novel and modern confession. As Scholes says, "Cellini's *Autobiography* seems to demonstrate that even a candid view of one's own life will be recorded in terms of the representational types that have been invented by narrative artists, that all knowing and all telling are subject to art" (p. 154). The actual genealogy of a work of art reveals a closetful of the most surprising ancestors. If we are to know this genealogy, life is just about the last place we should look.

When the view that physical objects—the substances existing "out there" independent of us—are ultimately real (Singer, 1977) provides the platform from which symbolic processes are investigated, it leads to gross misunderstandings regarding the nature of symbols and what they represent. If the focus of inquiry is upon the regularities "out there," then verbal, numerical, and particularly visual symbols (which provide some of the same information as objects "out there") seem to function in the role of merely "standing for" substances "out there." In this view, symbols play the secondary role of providing the means by which the character, relationships, and functions of first order "reality" are depicted and described.

If, however, we look more carefully at the origin of symbols, primary and secondary roles disappear. From cognitive psychology comes the notion that reality—at least the only reality we know—is, in effect, our mind's *model* of reality, the model that we are continually in the process of constructing and modifying (Powers, 1973, p. 24). Mind is not viewed as intrinsically sensory and passive but as

> a motor actively generating not only its response outputs but also its sensory "input" through the restructuring of its own activity. . . . If the higher mental processes are seen as (motoric) skills, then the problem of meaning becomes that of representation of

> information within the CNS [Central Nervous System]. (Weimer, 1974, p. 429)

Thus we construct from the physical world our perceptions of natural objects, our graphic depictions of objects, and our memories of both—all of which may function as symbols. As such, each has potentially the same status, at least as far as our reality is concerned.

Assuming this point of view, no one symbol necessarily has authority over another. Goodman (1968) presents Gibson's argument that in so far as the visual arts are concerned, nature does not necessarily dictate how the illusion of space in landscape should be depicted. Gibson is emphatic in stating that the use of perspective in a landscape is "not merely a convention to be used or discarded by a painter as he chooses." He goes on to say that "when the artist transcribes what he sees upon a two-dimensional surface, he uses perspective geometry, of necessity" (in Goodman, 1968, p. 11).

Goodman counters the Gibson argument by showing how artists who wish to produce spatial representations that Westerners will accept as faithful must actually defy the "laws of geometry" (p. 16). Morse Peckham (1965, 1967) goes even further with the idea that visual signs are representations. He claims that such an issue could only arise in societies in which painting and sculpture developed techniques of extremely high iconicity (or realism—for example, a situation in which a landscape painting and a piece of natural terrain contain a good deal of similar information) and in which there was an aesthetic tradition holding the notion of art as imitation. Peckham (1965, 1967, pp. 96-99) cites Arnheim's example of a very young child's use of a circular configuration as evidence that a visual sign is not a representation but a categorical sign. According to Arnheim, this circular configuration functions at one stage in the child's development as a categorical sign for all perceptual configurations. We concur with Peckham that visual signs are not representations of substances "out there" (Wilson and Wilson, 1977); but we believe they are indeed representations of something else.

First, however, we need to make one further point, one suggested by Paul Ricouer (1977): signs should be considered to be contemporaneous. That is, one sign does not precede another. Indeed, we claim that in so far as art is concerned the "real world out there" is just another sign system and that the natural signs we construct perceptually from the environment are just that—signs with the very same status as the graphic configurational signs we construct perceptually from a painting. Both sets of signs are acts of mind with neither dictating to the other the form it should take; but through transactions between these two sets of signs and other sign systems, there is certainly the possibility for sign and symbol systems to have a great deal of influence on the manner in which the mind perceptually organizes other sign and symbol systems.

What Do the Symbols of the Arts Represent?

Very simply stated we claim that the symbols of the arts represent the symbols of the arts. Why this is so has to do with the nature of cognition and of the symbols that are formed through acts of cognition.

One of the unique insights of cognitive psychology has been the rejection of the notion that what we learn and what we remember are discrete bits of information that can somehow be retrieved from storage compartments deep within the brain. The new hypothesis is that what we do "store," if storage is even an appropriate term, are deep structural rules for the generation of elements. Pribram likens this generation to a holograph where

> images are constructed when input from inferior temporal cortex (or its analog in other perceptual systems . . .) activates, organizes the distributed holographic store. Images are produced and are therefore as much *a product* of the "information residing in" the organism, as they are of "information" contained in the environment. (Pribram, in press, p. 88)

These internally produced images are schemata. Neisser (1976) refers to schemata as conceptual gestalts, as "that portion of the entire perceptual cycle which is internal to the perceiver, modifiable by experience, and somehow specific to what is being perceived (p. 54)." Neisser sees these schemata functioning as acceptors of information as it becomes available to the senses and then, having been changed by that information, as directors of "movements and exploratory activities that make more information available," and therefore as subject to further modification (p.54).

According to Neisser (p. 20), "because we can see only what we know how to look for, it is these schemata (together with the information actually available) that determine what will be perceived." Additionally, the perceiver is "changed" by the information received, in the case of the skilled perceiver by "an infinitely rich texture of information." The "change" is such that the perceiver comes to possess not a newly existing "inner replica," but an altered "perceptual schema" that will in turn alter the course of the next perceptions (p. 57).

These conceptual gestalts or schemata are the realities from which the external symbols of the arts are generated. These formed symbols that have their basis in mental schemata are in effect external manifestations of schemata. Consequently, the symbols of the arts are abstract, paradigmatic, and prototypical. As such, the arts are carriers of information that is different in some very important ways from information carried in the nonart environment.

In the arts, images, patterns, configurations, plots, characters, and so on are stripped of extraneous qualities; their essential qualities are isolated and enhanced. Time and space are compressed and extended; images and episodes are frozen. Furthermore, a given work of art may be perceived and re-perceived, allowing for repeated experiencing of the information it contains.

On the other hand, the images and events of the nonart environment flow by in a continuous and often dull and uneventful stream, punctuated only occasionally by a surge of the excitement, vividness, and eloquence that are the essence and substance of art. It is no wonder that the orienting schemata we acquire through our experiences with art are continually being employed in nonart realms. John Randall (1958) says it well:

> The aesthetic qualities we make out of the painter's artistic qualities clearly teach us how we see selected aspects of the world more adequately than we could see without their assistance. Sometimes they teach us how to see the face of nature, or the works of man; sometimes they teach us how to see color and form, their relations and qualities. They reveal powers and possibilities we had not noticed before. (pp. 289-290)

We cannot resist one further point. Just as our schemata lead to the abstractions, prototypes, and paradigms found in artistic symbols, which in their turn direct our anticipations of the nonart world, so too the schemata of the arts orient us to the symbols that we might use in our own art-forming processes—to the range of images, codes, and characters available to us. This is the symbol recycling process.

What is Recycled: A Structural Analysis of Visual Narrative

Our analysis of the various contents of young people's visual narratives is necessarily complex, and it draws upon sources as varied as myth, fiction, language, games, cinematography, and art. Just as Robert Scholes (1972) sees structuralism as the method by which literature might be studied, we will consider this narrative art form as a closed system with a structure that may be studied and analyzed. Scholes says structuralism

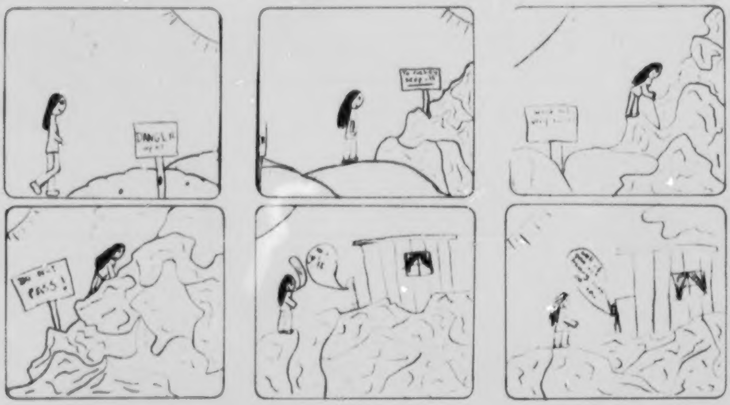
> may claim a privileged place in literary study because it seeks to establish a model of the system of literature itself as the external reference for the individual works it considers. By moving from the study of language to the study of literature and seeking to define the principles of structuration that operate not only through individual works but through the relationships among works over the whole field of literature, structuralism has tried—and is trying—to establish for literary studies a basis that is as scientific as possible. . . . At the heart of structuralism is the idea of system: a complete, self-regulating entity that adopts to new conditions by transforming its features while retaining its systematic structure. (p. 10)

Beginning with the description of a series of six drawings produced by an eleven-year-old child in response to a request to "tell a story through the pictures you draw," we will indicate some of the mythical images around which the visual narratives of young children are organized, and we will describe the structure of the grammar of these pieces, the acquisition of conventions or codes, and the sources of the various configurations used in the depiction of these stories.

These aspects of visual narratives relate to Todorov's three general aspects of the narrative text. For Todorov,

> any work of fiction may be considered from the point of view of semantics (the content or world that it evokes), from the point of view of syntax (its structural features and their combination) or from the point of view of rhetoric (*aspect verbal*—including such matters as diction, point-of-view, everything that has to do with the actual words of the text). (Scholes, 1972, p. 112)

For reasons that will be obvious as the story proceeds, we call this particular narrative "The Climb."



In the first frame, a young girl, walking on what appear to be the gentle curves of some grassy mounds, encounters a sign declaring "DANGER keep out." Ignoring the warning, she continues to traverse a landscape that now appears to be somewhat more craggy than it did at first glance. Giving credence to this is another warning: "to rockey (sic) keep off." As the terrain becomes more rocky and the slope steeper, the figure, ignoring yet a third sign, bends to labor up the jagged precipice. After what is obviously a very difficult and arduous climb, she reaches still another warning, "Do not pass." In the fifth frame, the climb is ended, a building appears at the summit, and a figure behind the opened door says "Hey, get off," to which the girl answers "No." In the sixth and final frame, the figure confronting the girl answers surprisingly, "Well if your (sic) not leaving come on in."

Images of Mythic Proportion and Paradigmatic Scope

The story contrived by the 11-year-old child was paralleled some months later in the quest of a 27-year-old amateur mountain climber who scaled the sheer 1360-foot face of the south tower of New York's World Trade Center. His ascent was as arduous as that depicted in the story, the warnings as clear (two policemen ascending beside him on a motorized scaffolding, his proposed punishment a $250,000 lawsuit by the city), and the ending as anti-climactic—a token fine of a penny for each of the 110 stories he had climbed.

The central organizing theme of "The Climb" not only finds its parallels in the media, but this same quest, journey, or odyssey appears universally in literature, art, and the narrative drawings of young people. The space odyssey is the journey that occurs most often in children's art, with a genealogy traceable all the way from Jules Verne to Buck Rogers and Flash Gordon, and from *2001* to Captain Kirk and Mr. Spock, and back to an even greater tradition of odysseys dating from Homer and Dante.

In his study of Darwin's "Tree of Nature" imagery, Howard Gruber (1977) says that the vehicle for much of Darwin's thought is a group of images of wide scope: "An image is 'wide' when it functions as a schema capable of assimilating to itself a wide range of perceptions, actions, ideas" (p. 24). Calvino's concept of contraries would seem to be such an image, one carefully chosen, constructed, and reconstructed over time, an image with which to regulate "the future course" of his work (p. 27).

Calvino continually plays with the concepts of contraries—good and evil, life and death, splendor and decay. He builds his body of work upon this theme, describing one city that is many cities or many cities that are one city, each ever a duality, each at once alabaster and coral and serpentine, and rusting sheet metal and sackcloth, each consisting "only of a face and an obverse, like a sheet of paper, with a figure on either side, which can neither be separated nor look at each other" (Calvino, 1973, p. 105). He declares that "the negative is necessary because without it the positive is not positive" (Calvino, 1976, 1977, p. 101).

In the visual narratives of children, too, the themes of good and evil, of justice, of birth and rebirth, of the cycle, of growth, of metamorphosis, and of the odyssey occur with amazing consistency. We believe that myth has over time provided cultures with these images or schema from which young people assimilate their own images for employment in their narratives. Maranda (1972) says that myths in our complex society

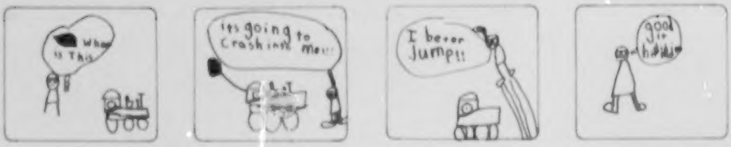
> are manifested in idioms different from those in which they were expressed in the past and in which they are still expressed in traditional societies. The passage from one idiom to another was effected through a recoding process that became generalized with the spread of literacy and technology.
>
> The triumph of the small but clever one over the clumsy giant may be narrated by an elder in a remote European hamlet in the form of a folktale or it can be found on television and cinema screens, not to mention comic strips. It is also repeated in wide-circulation magazines and newspapers in the North American ad-

> vertisements of Volkswagen cars. Like the clever little one, like the Bible's David, the buyer of the VW has plenty of power in reserve—mental power as he beats the system, Detroit's big vehicles.
>
> Then, it makes little difference, still in technological societies, that the metamorphosis of a "beast" into a handsome male, who will conquer the glamouring princess in the Eden of Ads, be the work of a tradition-consolidated magical agent or of mass-media established brands of deodorants or mouthwashes. Little does it matter, similarly, whether Cinderella becomes a mysteriously seductive woman with the help of her godmother or that of a skin-beautifying soap. Technology convinces us that it can achieve what our forefathers thought magic would do.
>
> The systematic chains that moulded, and lived through our ancestors, still perpetuate themselves among us, from the poet to the advertising agency, the cartoonist to the script writer to the novelist. And our paradigmatic sets are also consistently traditional: variations in contents erode semantic grooves very little, for the functions that direct the flow of imagery are as deeply seated as our conceptual habits. Cinderella, salesgirls, devoted housewives, Jack (of the beanstalk), newspaper boys, tired executives—all feel at the back of their minds, the nagging dream of the great adventure that culminates in long-lasting and private blissfulness. (pp. 16-17)

And so, we might add, do the George Willigs who would scale the towers of the World Trade Center and the children who create their visual narratives. The scope of the child's image, however, is not so wide as that of a Darwin or a Homer or even a Calvino. Climbing to the top of a rocky precipice is merely a rudimentary depiction of the larger Odyssean image.

Narrative Grammar

Just as quest or odyssey was the image or metaphor upon which the theme of "The Climb" was constructed, so the series of pictures itself constitutes a set of structural elements comprising a plot. To these elements Leondar (1977) attributes a set of structural rules not unlike those of contemporary linguistics, holding with the narrative grammarians that "literature like language, is a system, an orderly arrangement of abstract elements governed by combinational laws" (p. 175). Leondar describes a grammar for children's early narrative, which she terms "primary narrative," consisting of four phases, the first of which is a stage setting or an introduction to the ordinary state of affairs. The second phase introduces some misfortune that disrupts or creates a conflict. Phase three reverses the misfortune, while the fourth or final phase entails the report of an event which restores the status quo (p. 181). An example of primary narrative appears in the following four frames produced by a six-year-old child, each frame corresponding to one of the four Leondar phases.


wha is This
its going to Crash into me!!!
I beter Jump!!
good it

Frame one shows a figure and a strange vehicle that appears to resemble a locomotive (but we were informed that it is a "super cycle"). The figure idly wonders "What is this." In frame two, the disruption comes with the realization that "its (sic) going to crash into me!!!" In the third frame, the danger is averted as the figure, with an astounding leap clearly calculated to clear the vehicle, springs into the air, thinking "I beter (sic) jump!!" In the final frame corresponding to Leondar's fourth phase, the figure smiles, "good it didint (sic) hit me."

This primary narrative appears to exist in the tradition of Jolles' "simple form," particularly that of the *tale* "in which disasters threaten regularly but are always avoided in the end" (Scholes, 1973, p. 47). To analyze the plot of "The Climb" only by these means, however, would be to oversimplify, because although the immediate rocky danger has been avoided through sheer pluck, dangers still exist for the viewer and perhaps for the narrator as well. Who is it in the building? What will he or she do? What will happen? A more complete examination of *plot as structure* in children's stories is that of Brian Sutton-Smith, Botvin, and Mahony (undated).

Of the various structural-analytical systems examined, the Marandas' system of four levels of conflict or interaction best analyzes "The Climb." Sutton-Smith et al. (pp. 162-163) summarize these levels as follows:

1. Tales in which one power overwhelms another and there is no attempt at response.
2. Tales in which minor power attempts a response but fails.
3. Tales in which minor power nullifies the original threat.
4. Tales in which not only the threat is nullified but the original circumstances are substantially transformed.

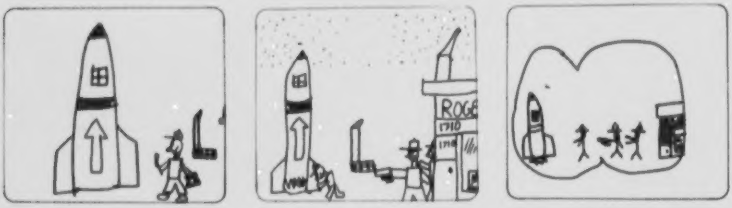
"The Climb" falls into a Level 2 response since a threat still exists; the danger has been escaped temporarily but has not been nullified. If the level of story is related merely to age, however, then we agree with the Sutton-Smith et al. assessment of this particular system that there are indeed other elements at work that require examination.

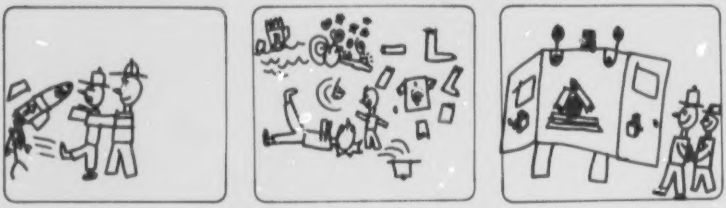
Of the hundreds of visual narratives we have examined, most could best be analyzed using the system, outlined by Sutton-Smith et al., by which the Russian Vladimir Propp set out the structure of plot by employing the fundamental elements of action. It should be pointed out that we believe there are very basic differences between the stories collected by Sutton-Smith and the visual narrative that we have been examining. Although we claim that the most important visual narratives produced by children are those that they do on their own, in non-structured spaces, and during unstructured time (Wilson and Wilson, 1977b), and while there is reason to believe that in some cases at least the elicited narratives are based upon or are even duplicates of these very private narratives, our data on visual narratives were collected within the structured limits of school time and space. A visual narrative of six or eight or even twelve frames contains neither the complexities nor the embellishments of a story given unlimited resources. There are also some ways, which we will point out later, in which the visual mode may provide a greater scope of expression. Nevertheless, similarities do exist.

Propp's basic concepts or primary level of "villainy versus villainy nullified" and "lack versus lack liquidated" again refer to Leondar's primary narrative and Jolles' simple form. Secondary functions by which villainy or lack are then mediated are added to these: "Thus villainy can be mediated by threat, attack, chase, violence, torture, etc. It can be nullified by defense, escape, release and defeat" (Sutton-Smith et al., p. 167). The categories by which we are attempting to analyze these visual narratives similarly include pursuit, predicament, violence, cataclysm, accident, conflict, and confrontation—those categories that are confronted only occasionally in life and yet minute by minute in narrative art.

Codes of Framing in Visual Narrative

In addition to the rules governing narrative grammar, there are rules or "codes" for the composition of frames. Søren Kjørup (1977) in his paper "Film as a Meeting Place of Multiple Codes" defines a code as "a system of rules which make certain entities (sounds, designs, etc.) count as, that is mean something" (p. 38). "The Climb" is shown through a series of six medium "shots" all from the same relative position with regard to the subject; the scene changes, but the angle of the shot and the size of the image do not. This narrative by a first-grade boy is another matter:



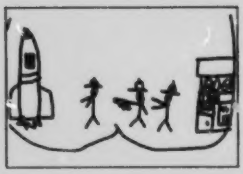


In the first frame, a villain with a lighted match steals toward a rocket. In the second frame, there is a wider view of the rocket being lighted and of two policemen (smartly cropped just above the knees by the lower edge of the frame) approaching with guns drawn. The third frame shows us that the wider view of frame two was no accident. In this long shot (as though seen through binoculars), the villain is apprehended. In frame four, we are back to a medium shot. The police are too late and the rocket blasts off; but, as we can see, the villain is much closer to the rocket than are the policemen. In the fifth frame, the effects of the blast are obvious. Seen at a greater distance than number four, and more surprisingly from a higher angle, are a blown-over policeman, two blasted-off hats, and a blown-apart villain along with a fine array of limbs and other body parts. The rocket, too, has crashed nose down in water. In frame six, two self-congratulatory policemen view the remains of the villain that have been loaded into the back of an ambulance.

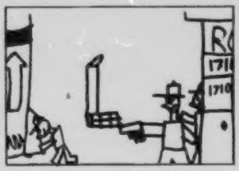
Obviously, scene changes, long shots, and above-eye-level views are not the stuff of our everyday here's-the-way-the-world-presents-itself view of life. In everyday life, events unfold smoothly and gradually without these abrupt changes in scene. The changing scenes of this narrative are the stuff of comic books, movies, and television. It was surely not scenes from ordinary life that provided the material from which this six-year-old child generated the codes for the scenes of his narrative. In other drawn narratives we have collected, visual treatments translated from cinematography such as time-lapse sequences, zoom shots, and extreme close-ups, regularly appear.

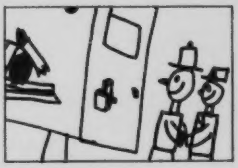
Graphic Configurational Codes

We began our analysis of the various contents of young people's visual narratives by indicating some of the mythical images around which children organize their productions. We now wish to turn to the shape or configuration of the actual objects within each of the frames of the narratives. In a recent paper (Wilson and Wilson, 1977 a), we outraged many of our colleagues in art education by claiming that from the teenage years onward the configurations of the images drawn were modelled after other graphic images. Let us point to just a few of the conventional features of the configurations already acquired by the six-year-old boy in the "Rocket Villain" narrative.

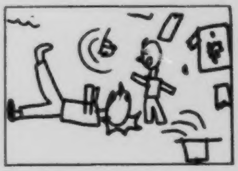


The boy has two distinct ways of depicting figures: in one, the major forms of the figures are shown with geometric rectangles and circles; in the other, with the conventional stick figure. The geometric figures are employed flexibly enough to show walking, kicking, falling, and so on. (It is interesting to note in this regard that fewer than 20% of nine year olds nationally are able to depict a figure so that it appears to be running [National Assessment of Educational Progress, 1977, p. 98.]) The expressions on the faces also vary from sternness and shock to self-congratulatory pleasure.

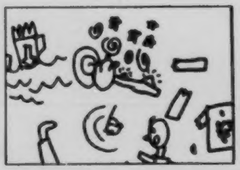




The ways of depicting these expressions seem surely to have as their source the expressions of comic book and comic strip figures. Such a speculation seems even more plausible when we look at the motion lines showing the kick and the falling hats, and especially when we see the manner in which the "distress" of the injured villain is shown with curlicues, stars, and radiating lines to show painful lumps. Of course, the configurations have a great variety of sources—an often used source is the drawings of other young people, especially those a year or two older.



We should also note the availability of a stock of standard characters—the heroes, superheroes, innocents, monsters, cute animals—already preformed and ready for drafting into whatever service a narrative might require or some activities the characters themselves might suggest.



Other Codes

Visual narrative is a "meeting place of multiple codes," in which, as Kjørup (1977) says of film, "The codes work together in such a way as to elucidate one another, some because they are basic to others, and all because they help to clarify which other codes are actually used, and how" (p. 45). We have spent a good deal of time illustrating the range of images broad and narrow, the grammar of plots, the ways of presenting and composing frames, the configuration of objects, and the characters—archetypal and otherwise. We could also have mentioned other aspects of visual narratives: (1) the settings in which the action occurs; (2) the great range of subject matters such as space, sports, domestic genres, dreams, and machines; (3) the range of resolutions from tragedy to irony, and (4) the different modes such as satire and humor. And we have said nothing of the language in the form of commentary, dialogue, signs, and the inevitable ballooned cry of "Help" used to indicate predicament.

Throughout our discussion of the aspects of narrative, we have pointed to the conventions that must be acquired and that once acquired become recycled in young people's own visual narratives. Leondar (1977) observed as she collected verbal narratives from children that "any child of normal endowment who is old enough to speak a few consecutive sentences has some conception of narrative fiction. No toddler past his second birthday appeared dismayed or perplexed by the request to tell a story" (p. 179). But what has utterly astounded us in our study of visual narratives is the mastery of the complexities of visual forming that is achieved by some young people at a very early age. We should add that the young people who have achieved their mastery have done so by and large without tutoring inasmuch as visual narrative is not a part of their classroom art instruction, and is only occasionally a part of language arts instruction. (We are presently developing a program of school instruction in all phases of visual narrative and plan to assess its effect on both spontaneous and elicited narratives of students from six to fourteen years old.)

Such attention to what seem to be utterly conventional matters of convention-acquiring and of relationships among conventions, with virtually no thought for creativity and aesthetics may be thought shortsighted and even wrongheaded. It might be claimed that such an approach to the study of cognition and the symbolic processes in the arts seems to reduce the investigation of art-making to a study of the structure and relationships of various sets of rules. But as Scholes (1974) says, such an analysis would isolate the creative from the noncreative events.

First, a comment about creativity: there is a nearly 100-year-old belief in art education (and perhaps the same holds true for education in the other arts) that virtually every painting, drawing, or construction produced by young children is creative. Creativity is considered to be on the wane when adult influences are detected in children's products; therefore great pains are taken to avoid any imposition of rules or standards from outside the child (Wilson, 1967; Wilson and Wilson, 1977). Yet the position we have taken here asserts that cognition in the arts is a matter of acquiring the rules governing symbolic codes. Indeed, the creativity so highly desired should not be mistaken for the pre-conventional spontaneity of young children. Creativity (that condition of producing something culturally and historically original) can only be achieved *after* the rules governing various symbolic codes have been acquired. In the meantime, any investigator or teacher of the arts can take continual delight in the novelty, inventiveness, and innovation that occur in virtually all the artistic productions of young children.

Although we have concentrated our attention on the conventional images, codes, and configurations of young peoples' visual narratives, the aesthetic aspect of these elements is always present to delight us. It is important to note, however, that there is an aesthetic dimension to which young people respond that relates only minimally to those standards espoused and valued by adults. Although it would appear that these aesthetic matters are the means rather than the end product of visual narrative, nevertheless our investigation has helped to broaden our conception of the domain of the aesthetic far beyond matters of form alone.

For young people, the aesthetic in their visual narratives encompasses such things as the quality or unique flavor of character, setting, action, and resolution as well. Attending only to the aesthetic dimensions of form or to the literal aspects of content alone is obviously a mistake. We need ways of attending to the appropriate fusion of both. This is the intuitive stance children assume toward their own productions, and it seems an entirely appropriate stance to be taken by the investigators of those productions.

How the Symbols of the Arts Are Transmitted and Transformed

We have taken the position that symbolic formation in the arts cannot simply be mapped as a superhighway leading from the raw material of "real life" to the symbols of art. A far more accurate, and useful, and a vastly more complex mapping results from considering the various arts as essentially closed structures with complex sets of rules governing their various elements, both with regard to the composition of the elements and to the manner in which the elements are combined and extended. Such an orientation assumes that the world "out there" is only one set of symbols that transacts with the symbols of the arts, and that often there is only a minor trail from the symbols of "real" life to the symbols of art. We think the proper focus of investigation is on cognitive activity relating to symbolic transactions along the interconnecting roads of the various arts as well as among the arts and other symbols. Specifically, there are three areas of inquiry we wish to illustrate:

1. The manner in which various conventions (images, subject matter, codes, and so forth) are transmitted over time in a single art form.
2. The manner in which the demands of symbolic codes and symbolic media alter internal representations during symbolic forming processes.
3. The manner in which various conventions (images, subject matter, codes, and so forth) are transformed through transactions among art forms.

The Transmission of Symbols Within an Art Form

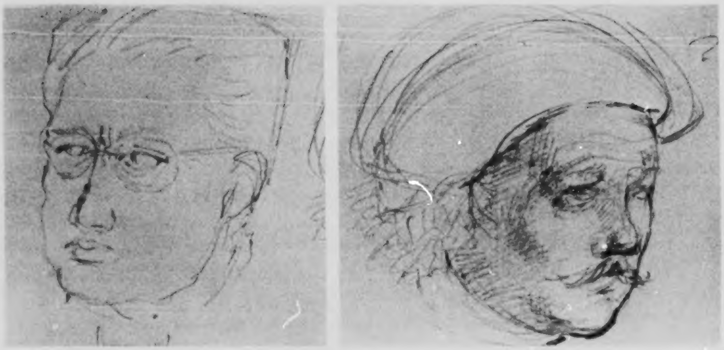
In "An Iconoclastic View of the Imagery Sources in the Drawings of Young People" (Wilson and Wilson, 1977), we attempted to trace back to their sources the images that high school and college subjects personally claimed to draw most frequently, as well as a standard set of objects such as humans, chairs, horses, army tanks, and so forth that we asked them to draw for us from memory. As they drew, the subjects were questioned in an attempt to determine the origin of each configuration. In many cases, individuals knew the precise source (often we, too, knew the sources before we were told) or even the individual from whom the configuration was borrowed. Our finding that so many of the drawn configurations had their sources in other configurations discounted notions such as Arnheim's (1974) that drawings of objects were based first on observations of objects in the outside world, and then on the inventing of abstract mental equivalences for the objects with the subsequent making of drawings from those equivalences. Of course, such an operation is possible, but it is seldom required, or used, as we will illustrate.

Our inquiry has since involved artists who have a great range of internal schemata that provide the images from which they make drawings for us. We find also that their introspections are most insightful. Currently we are relying totally on these introspective accounts, but we think that it is possible to design experiments that will confirm the hypotheses we are developing.

To illustrate the way in which symbols are transmitted within an art form, we will present a portion of an interview with a thirty-nine-year-old male artist and university professor of art. The artist has studied with an extremely competent academic portrait and figure painter, Alvin Gittins, and with two American abstract expressionists, Robert Motherwell and Stephen Greene.

When the artist was asked to draw a portrait of John W. (an elderly man well known to us and to the artist), a generalized and quite unlikely portrait emerged after approximately ten minutes of work. These comments were made as the drawing progressed:

> The first things I'm thinking about are the police drawings [composite drawings of suspects]. I'm trying to remember.... John's got a shock of white hair, it's kind of squarish. I find myself doing



> a stock mouth that's typical for me to do. I guess I haven't looked at John's mouth. I remember John's eyes better. I remember his white hair, prophet-like, I'll look at him more clearly next time.

Immediately following the completion of the portrait of John W., the subject was asked to draw a portrait of Rembrandt. This time, instead of the pausing to recollect features that characterized the first drawing process, the drawing of Rembrandt was quickly begun and was completed in approximately five minutes with the accompanying comments:

> I'm having a particular portrait in mind, the self-portrait in the Met. There is a three-quarter view of him that I remember spending hours looking at.

The artist's reflections upon completion of both portraits were as follows:

> In the case of John, I was trying to close my eyes and visualize him—meeting him in the hall. I tried to freeze him in the most characteristic views—the most portrait-like. I tried to draw my memory of that view—a kind of holding of that view. With the Rembrandt, I started quite differently. I had a technique in mind and a view already in mind. The technique and the view were fused—one and the same. They weren't extractable from one another. In the Rembrandt portrait [the one recalled], I can even remember subtle changes of light on the chin here. It was like a familiar tune—like a passage from Bach. The subtle transitions—I saw them already in my mind. I just had to capture them. It was fixed, fused, and specific. With John, it was the filling out of a flux, and trying to fix the flux. It was a trying to match up the technique to use and the holding it in my mind.

Much of what we have claimed about the abstract paradigmatic and prototypical nature of art is borne out by the facility with which the mental schema of the Rembrandt painting was transformed into a drawing in contrast to the difficulty posed by the images of John W. existing in memory. Actually, what we observed in the latter drawing is an attempt to "map onto" the memory of John several stock programs (such as those formed in police drawings) for the drawing of a mouth, eyes, hair, and so forth.

From these and other accounts, we hypothesize the following:

1. When producing a drawing, an individual generates a mental schema which is congruent with the configuration that he or she wishes to draw.
2. When a congruent schema is lacking, then a similar or analogous schema is generated, one which may consist of several related sub-schema.
3. If a close analogous schema cannot be generated, then a new configuration (new for the individual) may be drawn by "mapping" a series of generated sub-schemata already existing as mental graphic-like images onto a schema that is not readily translatable into lines and forms.

In drawing "from memory," the mental schemata most easily transformed into drawings are those that are most congruent to or most resemble the symbol to be formed. It is the ease with which transformation by congruent schemata is accomplished and the economy achieved through minimizing the number of transformations from nonsimilar or nonanalogous schemata that function as key factors in these hypotheses.

Although we have formed these hypotheses as they apply to the act of drawing, we think that they provide models for other hypotheses relating to the transmission of symbols within a given art form. We believe that when the extensions are made they will explain the contention that symbols of art are the source of the symbols of art.

Symbols Transposed, Translated, and Transmitted

It seems quite logical and credible to speak of the transmission of specific symbolic configurations in drawings, but it is quite another matter when mythic images, such as the odyssey, metamorphosis, life and death, good and evil, are considered. These images are not even necessarily visual in nature. Indeed, these images function through the assumption not of one but of a plurality of specific forms.

If, for example, the image "threat" were to be given form, the possibilities for symbolizing would be greatly reduced by the chosen medium—let us say drawing in this case. The possibilities are narrowed even more by a decision to symbolize threat by means of a wild animal. At this point, internal schemata must become quite specific—specific enough to recall the configuration for an animal such as a tiger or a wolf that is capable of symbolizing the threat.

This process of symbol forming involves more than one transaction. The symbol (tiger/wolf) is transmitted to the drawing only after the initial nonvisual image (threat) is transposed into a metaphorical symbol (wild animal) and then translated into a configural symbol (tiger/wolf).

Transactions Among Symbolic Modes

The manner in which images are transformed from one symbolic mode to another is a subject so rich that we can only suggest the possibilities for study. We have already indicated Calvino's flow from visual to verbal to visual to verbal. In Calvino's novel *Invisible Cities* (1974), Marco Polo is one of the emissaries of the Great Kublai Khan, reporting to him of the cities in the Khan's empire. At first, ignorant of the Levantine languages, Marco must communicate

> with gestures, leaps, cries of wonder and of horror, animal barkings or hootings, or with objects he took from his knapsacks—i.e. ostrich plumes, pea-shooters, quartzes—which he arranged in front of him like chessmen. (p. 21)

The result was that "the Great Khan deciphered the signs, but the connection between them and the places visited remained uncertain" (p. 22). As Marco Polo continued to report on his missions to the Great Khan's kingdom, he mastered the Tartar language and the national idioms and tribal dialects, and the situation changed:

> Now his accounts were the most precise and detailed that the Great Khan could wish and there was no question or curiosity which they did not satisfy. And yet each piece of information about the place recalled to the emperor's mind that first gesture or object with which Marco had designated the place. The new fact received meaning from that emblem and also added to the emblem a new meaning. . . . (pp. 22-23)

Earlier, in comparing the visual narratives we have studied to children's verbal stories collected by others, we alluded to the fact that the drawings might indeed provide modes of expression unavailable in language alone. For example, in the "Rocket Villain" narrative, the young boy's action lines, curlicues, stars, and radiating lumps speak more eloquently of the villain's distress than mere words.

Thus, graphic depiction lends to narrative a new dimension, as does narrative to graphic depiction, each adding new meaning to and in turn receiving new meaning from the other. Through transaction, the various art forms nourish one another in a continuous cycle of birth and rebirth.

The Arts as Ways of Making the World

We believe that young people in their narrative drawings are in the process of building interior models of themselves and of their worlds and that in so doing they are repeating the same process and achieving the same ends that artists have always accomplished for themselves and for all of us—providing a source of unique knowledge of ourselves and of our worlds.

The term *world* has many meanings. In *The Way the World Is* (1960, pp. 48-56), Nelson Goodman argues that there is no such thing as the way the world is, for the world is as many ways as it can truly be seen, described, pictured, and so forth. Goodman also talks of the futility of the proposal made by some that the way the world is might be grasped through a conjoining of all the several ways of seeing, describing, and picturing. He says, "This overlooks the fact that conjuction itself is particular to certain systems; for example, we cannot conjoin a paragraph and a picture. And any attempted combination of all the ways would be itself only one—and a peculiarly indigestible one—of the ways the world is" (1968, p. 6). For Goodman, to speak of the world that is in so many ways is "to speak of world-descriptions or world-pictures and does not imply there is a unique thing—or indeed anything—that is described or pictured. Of course, none of this implies, either, that nothing is described or pictured" (1968, pp. 5-6).

It has been useful for us to add to Goodman's view of world-descriptions and world-pictures the idea that a world is also the sphere within which one's interests are played out or the boundaries of one's activities, thoughts, and imaginings. A world thus becomes the doing and the done—not only the description and the picture, but also the describing and the picturing. Perhaps this fusion is little more than a recognition of the context in which symbolic worlds are wrought, in which there is an atmosphere not unlike Dewey's aesthetic quality with its uniquely pervasive flavor. Such a notion also recognizes that in the process of producing a symbolic world there is a discrepancy between the at once rich, complex, vague, and illusive cognitive schemata and the symbolic form by which they are ultimately bounded. So there is the sense that symbolic form carries with it, however inadequately, its contextual quality of coming to be as well as its being. In short, a world is comprised of all the acts associated with symbolic world forming as well as the symbolic forms themselves.

Our internal models of ourselves and of our environments are based on the worlds we cognitively construct, worlds to which we give tangible symbolic form through art. With each symbolic world constructed, other symbolic worlds are nourished, and meaning's universe expands.

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Larry Gross / *A Response to Wilson and Wilson*

Maps and Territories: A Discussion of "Recycling Symbols"

I found the Wilsons' paper most interesting and stimulating. In fact, there is little I feel I can usefully add to their cogent conceptualization of the role of symbol recycling in the creation of stories. So rather than dilute the force of their contribution through less elegant repetition, I would like to discuss some aspects of symbol recycling that have emerged from research not on story production but on the interpretation of stories. The point made by much of this research is that many of the rules we learn to help us make sense out of the world are acquired from "fictional" events and conventions, and conversely, many of the ways we know the world are applied to our interpretations of fiction. In a culture uniquely devoted to a belief in representational realism, we model the world in our symbolic productions and believe we have captured it. The map and the territory are often confused, and the symbols of art can be recycled as the facts of life.

Along with a colleague, Sol Worth, and a number of students, I was involved in a group of studies in which we showed children (and, occasionally, adults) a story told through a series of photographic slides (Messaris and Gross, 1978; Worth and Gross, 1974). In this story we see a man in a hospital setting wearing a white coat, and talking to a nurse; he is invariably identified as a doctor. He is shown talking to a secretary and then leaving the hospital. He is then seen walking through a deserted and run-down section of town where he comes upon a wrecked automobile with a man hanging out of the driver's seat (the door is open) onto the road. The doctor notices the victim, comes closer, and then looks at the man from about ten feet away. He then proceeds on his way. We next see him walking through a nicer neighborhood, entering an apartment building and then an apartment, and finally, sitting smiling at a young lady next to him on a couch (her wedding ring suggests that she is his wife).

From a conventional point of view, the most notable part of the story

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is the doctor's apparent failure to do anything to help the victim of the automobile accident. Most adults who have seen the story agree that the doctor is presented as a bad person. The story provides material for more detailed analysis. In the version we generally use, the doctor's conversation with the secretary before he leaves the hospital is an unpleasant one; he is seen angrily crumpling up the paper the secretary was typing and throwing it on the floor. We have here possible evidence of a consistently rotten personality or even the suggestion of an emotional upset that causes him to fail in his Hippocratic duty when he finds the injured man on a deserted street. The former interpretation, however, is more consistent with the final shot in which the doctor, safely home, is happily drinking a cocktail with his wife (some viewers have even suggested that they are callously laughing about the accident).

The more interesting interpretations of this story, however, are those of the vast majority of the children to whom we have shown it. With very few exceptions, young children (those up to about ten or twelve years old) recount the story without noting the doctor's failure to help the accident victim. Quite a few say he did help, others give elaborate interpretations which avoid the need for him to help: the "victim" was fixing the car; the "victim" was really a decoy for a thief who would have robbed the doctor had he approached any closer; the man who did not help was not really the doctor, but a second man who merely looked like the doctor. As these examples suggest, these children were denying the possibility that a doctor would refuse to help a person in need of medical aid.

The children quite uniformly saw the story as telling something about a doctor but were unable or unwilling to absorb the negative implications of his actions. They came to the story equipped with a powerful positive stereotypical image of doctors, and they were not willing or able to see this doctor as an exception to that image. Doctors are good, they would say, and this man is a doctor, so he must be good, and therefore he must have helped the victim (or, as we have seen, the "victim" really did not need help). The children attributed qualities they had learned—or had been taught—to ascribe to real doctors to the "fictional" doctor.

When we asked some of the children to give us a title for the story, they would say something like "The Doctor," or "The Doctor's Day," or "The Doctor Walks Home." Some kids would even suggest "The Good Doctor" or "The Doctor Who Helps You."

One of our primary concerns in talking to viewers about this story was to ask how they knew each element in their interpretations of the story's events. We wanted to know what evidence they would use to support their interpretations: would they invoke the conventions of storytelling or the facts of life?

The children, as I have suggested, use their "knowledge" of real life to support their reading of the fictional events we showed them. Doctors are good; my mommy told me so; my doctor is a nice man; he gives me lollipops—the doctor helped the man. Asked *when* he helped the man, many children said he did so "in between pictures."

These children were unaware of some of the conventions of fiction by which stories are articulated and interpreted. They mapped the story onto a stereotypic image of doctors that transcended an awareness of fiction as differing from reality. Besides—and this is crucial—they saw the events as basically real because they were depicted photographically. The story was real because, as one kid said, "I've seen a doctor in the hospital and that's what it looked like." In essence, it was real because it was not a cartoon.

The conventions saying that you have to work with the material given in the "text" and may not assume that important events can happen "in between pictures," or that knowledge acquired outside the frame of the story may not be allowed to override the structure of events within the story, these conventions are not yet part of the children's understanding of such realistic depictions. Things that look so lifelike may be taken as life. What we see in the children's interpretations of the photographic narrative is an assimilation of life-derived conventions into a fictional context so that the clear implication of a symbolic structure (that is, clear to adults) is rejected in favor of a stereotypic attribution of goodness to doctors. Life, in the form of social/personal stereotypy, overrules art, in part because of that art's mimetic success in appearing lifelike.

In another series of studies, a complementarily opposite pattern emerges. Looking at the ways in which television drama may affect the images of the world held by child and adult viewers, George Gerbner and I have seen strong evidence that this "art" (I use the term advisedly) will be mapped onto life (Gerbner and Gross, 1976; Gross, 1977). The representational realism achieved through photographic technology again provides part of the power by which the barriers between life and art are breached and the conventional patterns of fiction can be assimilated as if they were facts of life.

In our research we map the world of television drama—its contours, its demography, its ways and means—and we question viewers about aspects of the real world that may differ markedly from the world they see on television. In many instances, those who watch a great deal of television (by which we usually mean four or more hours per day—and this is by no means a small portion of our adult population) are significantly more likely than light viewers (controlling for age, sex, education, socioeconomic status, and so on) to give answers that reflect the world of television rather than the real world. Such cases are points where art's symbols are being recycled into life.

And again, when we question these viewers, the lifelikeness of the medium emerges as a central factor in its subtle verisimilitude: it looks real. The images we assimilate from mediated symbolic events such as television drama (and movies and prose fiction), and which may be absorbed into our conceptions of the real world, are not necessarily the prominent foreground elements of plot and star personalities. We know the story is fiction, but the backgrounds, which look so real most of the time, are much harder to resist. A vast amount of our knowledge of our own society and its institutions comes from television fiction: courtrooms and legal process, police stations and police work, operating rooms and medical procedures, the homes and lives of various classes and subcultures—these and many more are things most of us have learned about through "art," not life. And we may have absorbed a blend of fictional convention along with factual information. We do not really know which is which, in part because they look so much alike.

And finally, just as television's art can be confusingly mapped onto our sense of reality, so can its presentations of the "news" once again give us "life" that is often articulated in the conventional patterns of fiction. In a culture convinced of the iconic fidelity of technologically mediated images, the recycling machinery works both ways, mixing our sense of the real and the symbolic, of the territories and maps.

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Mihaly Csikszentmihalyi

Phylogenetic and Ontogenetic Functions of Artistic Cognition

To understand cognition, it is useful to begin from an evolutionary perspective. Like any other behavior pattern, the process by which organisms acquire knowledge is selected, shaped, and transmitted through ceaseless interaction with the environment.

> There are no such things as 'mind,' reason, thought . . . or truth. . . . It is [just] a question of a particular species of animal which can prosper only by means of a certain *exactness*, or better still, a *regularity* in recording its perceptions,

wrote Friederich Nietzsche about a hundred years ago, stating with his usual succinctness a thesis that was to become the basis for a later evolutionary epistemology. The purpose of knowledge, he went on, is to provide a species with a conception of reality that contains enough that is calculable and constant to allow it to make adaptive responses to the environment.

> The *utility of preservation*—and *not* some abstract or theoretical need to eschew deception—stands as the motive force behind the development of the organs of knowledge; . . . they evolve in such a way that their observations may suffice for our preservation . . . a species gets a grasp of a given amount of reality, *in order to master it, in order to enlist that amount in its service.* (Nietzsche, 1960, pp. 11-12; italics in original)

In other words, cognitive skills are valuable not because of their formal qualities nor because they approximate some absolute criterion of truth, but simply because they have in the past given our species an advantage in the struggle for survival. Contemporary psychological epistemologists are in essential agreement with this position, although they rarely endorse it with Nietzsche's unabashed enthusiasm (Campbell, 1960; 1974; Piaget, 1971; Popper, 1965).

Taking this functional-evolutionary view of knowledge should lead

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to a critical, relativistic acceptance of its value, as opposed to the present uncritical and total acceptance we give this favorite means for obtaining knowledge. If cognition is just a tool for adaptation, then we should constantly scrutinize that tool to see whether it performs its function properly. While evolutionary epistemologists recognize this necessity in principle, they rarely act on it since they tacitly assume that rational knowledge will be forever adaptive; that it is, so to speak, inextricably interwoven with the fabric of evolution. This is how Piaget, for instance, concludes his recent musings on the subject:

> . . . the very nature of life is constantly to overtake itself, and if we seek the explanation of rational organization within the living organization including its overtakings, we are attempting to interpret knowledge in terms of its own construction, which is no longer an absurd method since knowledge is essentially construction. (Piaget, 1971, p. 362)

Whatever else Piaget is attempting to express in this quotation, he clearly suggests that unfolding knowledge reflects a rational organization inherent in life itself. Such a faith in the coincidence of reason and evolution is comforting and even reasonable, yet it cannot be accepted without question.

The purpose of this essay is to explore the limitations of a rational cognitive mode first from an evolutionary perspective, and then, from the viewpoint of individual ontogenetic development. At the same time, I shall try to indicate both how artistic cognition complements rational cognition as an adaptive tool for the species, and what role artistic skills have in personal development. Nothing I will say is entirely original, since the distinctions I intend to draw have been drawn many times before, from Aristotle to Kant and down to our days. I hope, however, to be able to recast these old ideas into current conceptual frameworks, thereby making it easier to see their contemporary relevance.

Artistic Cognition and Evolution

The usefulness of rational cognition lies in its ability to make our interaction with the environment predictable. Predictability is the *sine qua non* of survival in a variable environment. In Campbell's words, knowledge consists of "stored templates modeling the useful stabilities of the environment" (Campbell, 1974). The mechanisms of storage become more and more adequate as they progress through phylogenetic evolution from habit to instinct, memory, language, and eventually, to science, which is the most accurate model of reality because it makes quantified predictions possible.

Rational thought acquires its power from a few characteristics which it might be worthwhile to spell out briefly here. In the first place, it relies on precise, unambiguous labeling of concepts or experiences. These labels are then related to each other in some symbolic system.

such as a natural language, a logic, a mathematics, a set of scientific principles, or an artificial language. Relations among the elements of the symbolic system are governed by a set of rules that constitutes a "nomological network." This network of rules makes the manipulation of the elements of the symbolic system possible. Thus we can do logic, we can do mathematics, we can do science. In each case, rational cognition permits us to substitute a vicarious symbolic process which is much more precise and more economical for trial-and-error adaptive attempts. Knowing the rules of geometry, for instance, one can calculate distance, space, and volume without expending the energy necessary to measure such quantities physically. Science is a rational system with the help of which one can rapidly weed out erroneous conjectures. Experiments consist of deliberate contacts with the environment that are designed to provide predictive information that could not be obtained through unorganized common sense and experience (Campbell, 1974; Popper, 1965).

The power of rational cognition, based on clarity, precision, and its structure of rules, is too obvious for us to dwell on at any length. It is not surprising that most thinkers see in it the highest peak of evolution—and its best hope. What I wish to point out in this context, however, are some of the limitations of rational cognition when it is viewed from an evolutionary perspective. As any dialectician might expect, the strengths of reason are the very sources of its limitations. For instance, the precision in labeling that is a prerequisite for rational discourse becomes a hindrance when one wishes to express ambiguous concepts or experiences. There are many feelings and events that are either too complex, or as yet too little understood, to be clearly assigned a value in a rational system. In everyday life, we often both love and resent our spouse, our job, or the lifestyle of our city, and—to make matters worse—we have little knowledge of the origins and dynamics of our feelings of love and resentment. Under such conditions, the precise labeling necessary for the operations of a rational system will result in disguising reality, rather than in helping to model it.

The rules of transformation that give such power to the nomological network of rational cognition have similar limitations. Any rule is by definition an exclusion. The simplest and perhaps the most basic rule on which Western thought rests, Aristotle's principle of noncontradiction, excludes the possibility that a thing can at the same time be its opposite. Everyone will agree that this rule is "true"; but it is so, only if one accepts the prior assumption that things in the world can be assigned to dichotomous, mutually contradictory categories. This assumption is now widely questioned, especially in its application to practical human affairs. That love and hate are opposites is no longer self-evident, nor is it clear that the notion of opposition itself, which is a prerequisite of any classification, is really a good model of reality. Every system of rules must result in simplification, in a radical exclusion of possibilities. To a certain extent, the power of a rule is directly related to its specificity, that is, to the amount of thought and experience it excludes. Mathematics acquired its tremendous power by excluding from its purview all aspects of reality except the quantitative.

One might draw an analogy with an army whose power also depends on the strictness of the rules which bind its members together in a common cause. The more soldiers can be reduced to "fighting machines" by denying them other thoughts, feelings, and actions, the more effective the army will be in achieving its purpose. When we consider this example, we can immediately see a possible contradiction. Historically, most armies that have tried to maximize their efficiency by reducing their members to fighting machines have come to bewildering ends. Apparently, the problem is that excessive specialization for any one purpose, when it excludes too many other responses to the environment, is not adaptive in the long run.

To return from the analogy to the topic at hand, it seems that a similar evolutionary constraint operates to limit the adaptive value of the rules of rational cognition. The rules of reason give us power to control and predict within artificially restricted dimensions of reality. It is dangerous to assume that this power is absolute. Although rational cognition, on the whole, has been adaptive, there are no grounds for assuming that increasing the powers of reason at the expense of other modes of knowing will be ultimately adaptive. Knowledge based on reason cannot escape the limits that its rules have established. Reason rules out the raw material out of which evolution is made—random variation (Campbell, 1974, 1976; Csikszentmihalyi, 1970).

Many thinkers have suggested that a different mode of knowledge is necessary to cope with the dimensions of reality reason is incapable of handling. Weber (1964) called it *Verstehen*, Polanyi (1974) *personal knowledge*. Some claim that we use at least four major epistemologies to approach reality: faith, intuition, reason, and empiricism (Royce, 1967; Sorokin, 1937). Others have explored the specific contribution of aesthetic cognitive processes (Collingwood, 1958; Dewey, 1934; Gardner, 1973). In this context, we are interested in art as a complementary alternative to rational cognition. In what sense can one say that the process of coding and decoding visual images is a cognitive process? If, as Campbell has written (1974), knowledge consists of "stored templates modeling the useful stabilities in the environment," then painting a picture or carving a sculpture conform to the definition: the resulting work of art is a "template" that "models" some aspect of the "environment"—whether what is being modeled is a "useful stability" or not depends on the merits of the work.

If reason and art both lead to knowledge about experience, then what is the relationship between them? Nowadays, the defenders of art often claim that art and science are essentially alike, that they are both rule-bound symbol systems that provide similar information about reality. The temptation to legitimize art by assimilating it to science is understandable, since the latter at this time has a much greater prestige. Doing so, however, distorts the nature of the relationship; for while it is true that both science and art are symbolic systems that provide knowledge, their function and structure are complementary and not redundant.

The process of reasoning that underlies science acquires its power through the clarity and precision of its symbolic coding. Art, on the other hand, acquires its power through the symbolic representation of experience that is ambiguous, contradictory, or not fully emergent in consciousness. Reason thrives on the application of rules that are selective, cumulative, and clearly specified. Artistic cognition is based on symbolic rules that are holistic, idiosyncratic, and implied rather than explicit. While science attempts to model "useful stabilities," art tries to represent unique configurations. While scientists try to produce unequivocal pictures of reality along clearly specified dimensions, most artists would agree with Kandinsky that their task is to express "mystery in terms of mystery" (Overy, 1969, p. 77).

But if this is true, what is the possible use of a cognitive process that fails to clarify the meaning of its symbols, that refuses to standardize its rules, that does not aspire to present a consistent picture of reality? Used as the only cognitive strategy, art would indeed be useless. But the power of art as a corrective to an exclusively rational approach resides precisely in those ambiguities that appear to be its weaknesses. From an evolutionary viewpoint, the value of aesthetic cognition is that it provides models for human experiences with which reason alone cannot cope. Artists see their task as using all their sensory and cognitive skills to tackle global existential problems. In so doing, they inevitably enter realms of reality that are still uncharted, that have not yet been colonized by the rules of reason. Therefore artistic cognition can provide the novel concepts and the unthought-of rules constituting that variation without which knowledge could not evolve.

So far we have dealt in rather abstract generalizations. Is there any evidence that artists actually see their tasks as including such a cognitive dimension? In a recently concluded longitudinal study (Getzels and Csikszentmihalyi, 1976), we asked a number of aspiring young painters and sculptors why they wanted to become artists. Practically none of them mentioned the creation of "beauty," "harmony," "order," or any other such aesthetic goal. Most responses centered instead on cognitive goals: the young artists said they painted in order to get a better understanding of reality. The kind of understanding they sought referred to areas of experience that were highly ambiguous, like life and death, or were very personal and complex. They wanted a better understanding of problems for which no rational solution is available; in fact, the knowledge they sought was often the kind that could not even be formulated as a rational problem.

In reading some of the answers young artists gave to the question "Why do you paint?", one gets a more concrete sense of the cognitive process involved in the making of art:

> I paint because it's necessary... it's something that you have to say. I can't say it in any other way. I can't write. It's the only thing that ever comes close to me making anything. I want to say something, but don't know what. It's a basic questioning of what one wants.
>
> I guess I don't know. I like it, I like to do it. Not knowing is part of why I do it. . . . My intention is to discover what my intentions are, formulate my opinions . . .
>
> Everyone has certain doubts about the reality of the world he lives in. I can't decide whether objects really exist. . . . I want to state visually things that don't exist and make them exist . . .
>
> I know the feelings I want to convey, but not the real reasons. All my work is related in the sense that they are areas of myself, facets of my personality. (Getzels and Csikszentmihalyi, 1976, pp. 20-21)

These quotations show that for the young artist art is clearly a cognitive process, an attempt to create a visual model for a pattern of experience. They also indicate how different such a cognitive process is from a purely rational one. The artists are trying to express basic desires, intentions, opinions, reasons for feelings through symbols; they want to make real, things that do not exist.

In our research, we found that this seeking for existential problems was not related to rational skills. Artists with higher scores on IQ tests or on other standard measures of cognition were no more likely than anyone else to engage in the kind of questioning that led to the formulation of artistic problems. On the other hand, artists who saw their task as searching for ways to express the unformulated problems of life and who acted on that premise produced art that experts rated as more valuable, and they were more likely to become successful creative artists (Csikszentmihalyi and Getzels, 1970, 1971; Getzels and Csikszentmihalyi, 1976).

The evolutionary contribution of this kind of knowledge can now be summarized more clearly. The world is fraught with forces beyond our understanding; it is full of events that can be explained in a thousand different ways, and yet never entirely understood. Reason is our best tool for holding on among these shifting fields of force long enough to survive. Yet reason alone is not enough. In order to control reality, its content and its movement must be drastically simplified. What is more, the model of reality rational cognition creates tends by its very nature to become rigid and self-contained. It runs the risk of becoming more real than the reality it was intended to depict. Where this happens, its usefulness for the evolution of life is compromised.

Artistic cognition plays a complementary role to reason; it deals with a type of knowledge that serves an alternative adaptive function. Art models reality in global terms, it eschews the fine calibration of reason in favor of modeling forces and relationships that are incommensurate when translated into a rational code. To accomplish this, art must venture into areas of experience that are not yet clearly understood and perhaps never will be. In this sense, æsthetic cognition is the cutting edge of our knowledge of the world. Trying to reduce art to science by assimilating its processes to those of reason can only serve to reduce our adaptive potential as a species. Art has different goals and different methods than science; it must retain its autonomy.

Of course, there is no way of proving that artistic cognition actually plays the vital evolutionary role that I am attributing to it. There is no way to demonstrate experimentally its adaptive function. But then we should remember that the same also holds true for reason. We can only infer that the reasoning process has helped humanity to survive thus far. In both instances, certainty must elude us; a strong inference is the best case that can be made.

Thus far, we have examined the function of artistic cognition from the viewpoint of the evolution of the species. It is now time to consider its role in the process of individual adaptation. Although the two are in many ways parallel, the phylogenetic and the ontogenetic effects should be treated separately, since the latter reveal aspects of the process of adaptation that are exclusive to individual development.

Artistic Cognition and Personal Development

A person who codes experience in visual media re-plays at the individual level the process that artistic cognition serves at the level of species adaptation. The artist provides concrete models for elements of reality that could not be expressed, and therefore controlled, by other means. In Hannah Arendt's words:

> The whole factual world of human affairs depends for its reality and its continued existence, first upon the presence of others who have seen and heard and will remember, and, second, on the transformation [by the artist] of the intangible into the tangibility of things. (Arendt, 1958, p. 95)

In our study of artists we have come across many examples of how this process works. An artist whose main problem in life was establishing relationships with other people—a task made difficult for him by a lack of understanding of his own and others' motivations—continually painted abstract canvases in which the relationships between colors and shapes expressed aspects of human interaction in symbolic form. A young artist whose idyllic childhood in Europe was destroyed by the War produced elegant paintings in which classical lines ended with a "sweetly painful jerk"—a dynamic representation of his own past experiences that the artist was still trying to assimilate and understand. Another painter disoriented by what he perceived as the lack of structure in his life adopted as his personal symbolic code a repetitive grid pattern which he painted on huge canvases.

Over and over, one finds that artists react to ambiguous tensions in their experience by formulating a visual model of their problem. As the inner problem becomes concrete in the work of art, it also becomes amenable to a symbolic solution. This process of making a diffuse personal problem real is rarely conscious, since the problem itself is rarely accessible to the artist's full awareness; nor does the symbolic solution on the canvas release the artist's inner tension once and for all, because the problem creating the tension is typically too deeply rooted in the human condition to be resolved completely. Nevertheless, this process does seem to serve a purpose. By dredging up uncontrollable feelings and experiences and by imposing a symbolic order on them, the artist acquires a precarious control over dimensions of experience that would otherwise entirely elude his comprehension.

Is art, then, nothing more than a form of therapy? Only if we are ready to admit that religion, science, and politics are also forms of therapy. In other words, we can claim that any human effort to control the unknown, whether through science or through art, is therapeutic in so far as it provides a better understanding of our position vis-à-vis the rest of reality. To do so, however, expands the definition of therapy beyond a useful scope. It is better to say that art, like science and religion, is a form of human action that increases knowledge and control over the process of adaptation, and that by doing so it may have an effect that might be called "therapeutic" from a mental health perspective.

In our studies, we came to the following conclusion concerning the dynamics of artistic creativity:

> It is a process by which an individual (1) experiences a conflict in perception, emotion, or thought, (2) formulates a problem articulating the previously inarticulated conflict, (3) expresses the problem in visual form, (4) succeeds in resolving the conflict through symbolic means, (5) thereby achieving a new emotional and cognitive balance. The aim of the creative act is not to reduce a drive in order to restore a previous equilibrium, but to reach out for a new equilibrium. The key to creative achievement is the transformation of an intangible conflict into a tangible symbolic problem to which the creative solution will be the response. (Getzels and Csikszentmihalyi, 1976, p. 246)

The making and experiencing of art is a process in which cognition and emotion are inseparably intertwined. It could not be any other way. The conflicts that art attempts to master cannot be encoded by the unambiguous symbols that reason relies on.

In the first place, the function of art in human development is to help uncover tensions and conflicts in experience and then to integrate these through symbolic means until a semblance of order and understanding is achieved. This makes art a tool for adaptation functionally equivalent to reason, though structurally complementary to it. Both art and reason, in Nietzsche's words, are ways to grasp a given amount of reality in order to master it, in order to enlist that portion of reality in one's service.

There is another sense in which art is a means to knowledge, and this is a potential inherent in the medium that we still know very little about. In my opinion, this is an extremely important function art can serve, and therefore I intend to discuss it in some detail.

Let us call the kind of knowledge described thus far *reflexive* knowledge because it provides symbolic models for experiences: the work of art becomes a reflection of the dynamic tensions within the individual. At the same time, the work of art provides a different type of information as well. I call this second kind of knowledge *constructive* knowledge because it uses the feedback the developing art work gives about the actions of the artist to build in the artist an image of who he or she is. Each time a person draws a line or molds a piece of clay a change occurs in the environment, and this change provides information about the artist's being. Constructive knowledge is information about agentic powers (one's power to control one's life), and it is perhaps the most meaningful information that any of us can get.

In order to understand the importance of this second type of knowledge, a brief theoretical detour may be necessary. Modern psychology has recently discovered that men are motivated by what appear to be two different sorts of basic needs. The first are the well-known physiological needs programmed in our genes, such as thirst, hunger, or sex drives, which work themselves out more or less automatically without our conscious intervention. The second set of needs includes "exploratory drives," "arousal needs," and "needs for competence," and it is often known under the heading of "intrinsic motivation" (Berlyne, 1960; DeCharms and Muir, 1978; Deci, 1975; Hunt, 1965).

It is generally assumed that the needs expressed in intrinsic motivation are genetically determined just as the physiological needs are. In my opinion, however, we must move to a different level of explanation to fully understand the needs underlying exploratory and competence behaviors. These needs are most clearly seen if we postulate that an individual becoming aware of himself or herself as a person *develops new needs that are the function of his or her self-reflective cognitive structure, rather than of the physiological structure of his or her genes.* In other words, as soon as an individual recognizes himself or herself as a person, he or she will need to sustain this recognition by constant inputs of energy from the environment. We shall call these the "existential needs" in contrast to the physiological needs arising from purely biological structure. The energy input needed to satisfy existential needs is information that confirms the person's existence as an autonomous agent (Csikszentmihalyi, 1976, 1978a, 1978b).

A self-conscious individual must constantly strive to prove that he or she exists as a psychological entity, not just as a physiological organism. Therefore individuals must continue to act and to monitor feedback from the environment in order to find out whether they are in fact autonomous agents, whether their existence makes a difference in the world. The information that satisfies existential needs is what was above called constructive knowledge because it serves to build up and maintain the cognitive structure of one's self. I am that which has done these things—the sum of all my actions defines the limits and dynamics of my being.

If this is true, then any kind of activity can satisfy the existential need, and art is not a unique source of constructive knowledge. This is certainly the case. Information that maintains the structure of one's personhood can be gotten from any intentional action: making someone laugh, making someone cry, making a lot of money, or burning down a house. Yet the ecological consequences of what information one relies on are obviously very great. Whether individuals confirm their existence by productive as opposed to destructive acts makes a great deal of difference for the total network of human interactions, even though in terms of their own existential needs the two kinds of information are both equally constructive.

The problem with existential needs is that they can never be completely satisfied. While physiological needs have an inbuilt ceiling (the physical energy needed for survival is limited by the metabolic capacity of the organism), existential needs have no inherent limits: selfhood is insatiable in its drive to confirm its existence. The danger arises when people confuse existential and physiological needs and then proceed to satisfy the former in terms that are appropriate to the latter. The outcome is that people are driven to accumulate physical energy and material objects not to assuage finite physical needs, but to satisfy infinite existential needs. The information we use to prove our existence becomes an extension of the energy we need to survive as biological organisms: the more material things we own and the more physical energy we control the more alive and powerful we feel.

Needless to say, this way of proving ourselves is a threat to our survival in the long run. When material resources are used to supply information about our self, the drain on the ecology becomes unbearable. We run the risk, in Arendt's (1958, p. 132) words, of "consuming the world."

The only way out seems to consist in rediscovering alternative sources of information for confirming our existence. Instead of constructive knowledge based on feedback high on energy, we need to learn how to interpret feedback that is low on energy, yet high on information. In other words, we must "deliberately choose a life of action over a life of consumption" (Illich, 1971). While this seems to be an impossible goal, there is no reason, in principle, why men could not learn to use symbolic information to satisfy existential needs.

In some recent studies, I have described groups of people who spend much of their time in activities that do not provide material feedback, but do give the participants a sense of enjoyment and fulfillment. These examples suggest that almost any kind of information can provide meaningful confirmation to a person's existential needs. It is not necessary to accumulate money or power to prove that one exists. One can get the same result by climbing a difficult rock face, by writing down musical notes one has heard in one's mind, by solving a complex mathematical equation. In each case, a person succeeds in controlling a narrow dimension of the environment, and the feedback is the information that he or she does make a difference because his or her actions have produced a result that would not have existed without those efforts: he or she has approached the summit of a mountain, has composed a new melody, or has solved a difficult problem (Csikszentmihalyi, 1975; 1976).

These examples have one thing in common: they all involve symbolic action and provide symbolic feedback. As opposed to traditional rewards like money or status, which are limited and costly, symbolic rewards are in principle inexhaustible and free. They provide an opportunity similar to that sunshine and the tides promise in terms of physical energy, while traditional rewards resemble our diminishing supplies of oil and coal. These considerations suggest that one of the major survival tasks for our society consists in making symbolic information about existence more readily available to people. If this were done, the almost exclusive reliance on material rewards might be eased. Of course, we shall continue to need objects and energy for our physiological needs, but we will not require increasing amounts of material products for our existential needs. We need to release the potential of symbolic energy by separating existential needs from concrete, material feedback. Once this is accomplished, the burden we currently place on each other and on the environment will become considerably lighter.

Within this theoretical context, it is clear that art plays what is potentially a tremendously important role. Art is a source of constructive knowledge that is very low on energy, yet practically limitless in the amount of information it can provide. By acting within the various symbolic media of art, a person can find out who he or she is at very little expense to the environment.

Before a person can derive the greatest amount of constructive knowledge from art, however, a few conditions must be observed. Dabbling in art without skills or without commitment does not produce any valuable information about the self. Working at it without receiving meaningful support from anyone else drastically reduces its potential for validating the self. In order to provide the most information, involvement in art should meet the following conditions:

1. A person needs to learn that making art is useful only if the visual symbols used are related to his or her genuine experiences.

This means that training in art must emphasize sensitivity to inner feelings, no matter how vague or ambivalent they may be.

2. A person needs to learn a variety of skills and to continue to grow in competence by perfecting one skill or by learning new ones. The more refined and diversified one's skills are, the more information about the self's existence one can produce.

3. A person needs feedback not only from his or her own actions, but also from other people who appraise those actions. Perhaps the most effective kind of constructive knowledge is that provided by the social environment. Hence, it is important for people who work in art to be legitimized by appropriate reference groups. In chess, for instance, there is an international rating system that allows players to determine their skill against a common standard. There are no financial rewards or privileges attached to the ratings, yet chess players are highly motivated to increase them, and they derive a sense of pride from knowing how good they are. The more such systems of symbolic recognition can be devised, the less exclusively dependent on material feedback for existential needs we shall become. There is no reason why art should not be structured to provide this kind of information.

As we become aware of the importance of our symbolic resources, we should become more inclined to devote our energies to maximizing their potential. In this respect, many primitive societies are vastly more civilized than we are. Their members recognize the power of symbols, of ritual, of ceremony and hold in great respect the practitioners of symbolic skills—the dancer, the poet, the artist, or the shaman. I think we must recreate a society in which recognition of symbolic power will again move to the center of the stage. We must encourage discovery of the new symbolic forms that are made possible by technological and scientific advances. It is not too farfetched to envision a federal Department of Symbolic Resources whose task would be to facilitate the satisfaction of existential needs for the people. By encouraging the development of autonomous, self-confident individuals, and with only a fraction of the budget, such an institution might do much more for our collective well-being than the Defense Department.

Conclusions

The ideas developed in this essay suggest that we should look at art as a process by which men extract knowledge about reality. Like any other form of knowledge, art is an adaptive tool by which we master forces in the environment in order to survive in it.

Art and science are both models that try to replicate the dynamics of existence in more orderly ways. But whereas rational cognition builds models based on clarity, precision, fixed rules of transformation, and narrow, self-contained although generalized symbolic systems, artistic cognition models experiences that are ambiguous; and therefore it must use codes that are multivalent, changeable, and holistic, yet highly specific. Rational and artistic cognition are therefore complementary approaches in that they provide knowledge about different dimensions of reality that would be inaccessible to each approach by itself.

The function of art at the phylogenetic level of adaptation is to provide concrete models—and therefore knowledge—of aspects of human experience that, although important, are not expressible in other forms. The tensions and conflicts people feel about life and death can be symbolically expressed in and experimented with through artistic media. This leads to recognition, ordering, and perhaps even resolution of conflicts that may otherwise paralyze a person's cognitive processes. The knowledge thus produced becomes an objectified record of past experience to be transmitted through the culture across generations. It is mainly through art that individuals can share each other's lives and thereby expand their own experiences while achieving a psychological integration with the species. It is mainly through art that we uncover and identify experiences that are not amenable to the specialized analysis of reason. In this sense, art is at the forefront of our knowledge of the world.

In terms of individual development, art fulfills two simultaneous cognitive functions. On the one hand, it provides reflexive knowledge about inner states, and thus it helps model inarticulate conflicts that the person can master through symbolic means. On the other hand, it provides constructive knowledge, that is, concrete information about the person's power to affect the environment, thereby satisfying existential needs. This last function of art brings the argument full circle: since art gives low-energy, high-information feedback to existential needs at the personal level, it has the potential of rescuing the species from its addiction to material feedback and thus helps humanity free itself from its dependence on a dwindling supply of physical energy.

These ideas are highly abstract, and one may take them as a pious academic exercise with no bearing on reality. But they were not presented with that intention. The challenge is to develop their implications and to begin the work of applying them in our social system. A certain amount of abstract thinking is necessary to gain a higher vantage point from which to see more clearly the lay of the land. That is what these ideas were designed to accomplish. The task now is to move from the map to the real terrain. The potentials of artistic cognition are clear, how to realize them is another question.

Chicago, Illinois
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David Feldman / *A Response to Csikszentmihalyi*

Discussion of "Phylogenetic and Ontogenetic Functions of Artistic Cognition"

I would like to respond to the totality of Professor Csikszentmihalyi's paper. I think it was the most ambitious paper presented at the conference. It is an enormously stimulating, thought-provoking piece of work. In terms of defining researchable issues I am not sure of its usefulness, but in terms of theory it is a piece that has great interest.

I will first respond briefly to a few points that seem to require noting. The bulk of my remarks will deal with what I think are the two major arguments in the paper: the role of what is called "artistic cognition" in evolution, and the role of the arts in individual development. In terms of the "reflexive" knowledge provided by art versus the "constructive" or of the reflexive in addition to the constructive, it seems to me that Professor Csikszentmihaly's use of reflexive is very similar to David Olson's use of "elaborate" to describe certain uses of symbol systems. That is, Csikszentmihaly's reflexive seems to describe the kind of system that tries to find out things about the world that would not be available without use of a certain symbolic system.

Secondly, I would like to quibble just a bit—not as a die-hard Piagetian by any means but as someone who has spent some time studying the Piagetian literature—with Professor Csikszentmihalyi's characterization of cognitive psychology (or what I would call cognitive-developmental psychology) as preoccupying itself with mapping the external world. Probably no topic has received more research attention from investigators interested in Piagetian work than the *object* concept. And the hallmark of that concept is, of course, the child's realization that he or she is in fact an object, different from other objects in the world. Indeed, the object concept translated into Professor Csikszentmihalyi's terms, is the beginning of the sense of self. It is possible that we are simply using words differently, but at this point I would want at least to enter the slight demurrer that it seems to me there is certainly room within a cognitive-developmental frame of ref-

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erence for the kind of "constructive knowledge" he emphasizes.

Now, if I may, I would like to turn to the two sets of issues that I consider to be of primary interest—I think they could hardly be more fundamental to the work of the conference. The issues I refer to, of course, are the concept that artistic cognition is crucial for survival of the species and the role that artistic expression (as I would call it) plays in individual development. I, like Professor Csikszentmihalyi, have been very impressed with the importance of evolutionary thinking for furthering our understanding not only of the arts but of all behavior, and I think he has done us a great service by bringing this matter to our attention and putting it before us for discussion. My intention here is not to do an injustice to his arguments but to reformulate them in ways that may be interesting to discuss and to play off one against the other. I hope what I have to say about both of these issues will be complementary to Professor Csikszentmihalyi's intentions, but of course, that remains to be seen.

First I would like to suggest that rather than thinking about artistic cognition as something requiring a new label, we opt for the more traditional term *imagination*. I prefer *disciplined intuition* (the phrase actually comes from Bruner), which is slightly fancier but brings with it the assumption that a person has acquired some discipline prior to effectively using what I am calling imagination. In my scheme of things at least, there is very little difference between what Professor Csikszentmihalyi has called artistic cognition and what I would call disciplined intuition.

When Professor Csikszentmihalyi says that art used as the only cognitive strategy would be useless, he seems to be suggesting that artistic cognition cannot be the exclusive or even the primary work of thinking, whether or not the activity is primarily a rational or scientific pursuit. I certainly endorse this idea, and simply want to say that disciplined intuition or artistic cognition is something that occurs, should occur, and will occur any time a person pursues any domain of knowledge toward its limits. It is the kind of activity that occurs in rational pursuits as well as in what are typically referred to as artistic pursuits. I would not make the distinction quite so sharply myself, but for the purposes of discussion it is at least clear. Professor Csikszentmihalyi goes on to suggest that after a while there is a kind of arteriosclerosis or hardening of the arteries that occurs in most symbol systems, especially rational ones, and that the process of imagination, or disciplined intuition, is needed in order to get beyond them. It is a Kuhnian argument about how paradigms tend to perpetuate themselves and have to be transcended. I would certainly agree that disciplined intuition and imagination, even in their more formal expressions, are required in order to transcend a paradigm. Csikszentmihalyi states that "art must venture into areas of experience that are not yet clearly understood and, perhaps, never will be. In this sense, aesthetic cognition is the cutting edge of our knowledge of the world."

Here again, attention is drawn to the value of imagination or intuition in ferreting out and exploring new possibilities. I would simply add that both rational and imaginative thinking are done within the context of a body of knowledge, a discipline, a problem that emerges in work. And finally, along this same line I would draw attention to the statement which I take to be the crux of the paper, perhaps its most important sentence: "Reason rules out the raw material out of which evolution is made—random variation." An extremely stimulating sentence. I would like to draw attention to the fact that reasoning, except in selective breeding, has very little to do with random variation, at least physically. The genes will do as they will, reason as we might about them. I think Professor Csikszentmihalyi is actually referring to *cultural* evolution, over which reasoning does have some control, both in that form which we call rational, and in that which we would perhaps call artistic, intuitive, or imaginative.

The words of R. W. Gerard (1952, p. 227) seem apropos here:

> Imagination, not reason, creates the novel. It is to social inheritance what mutation is to biological inheritance; it accounts for the arrival of the fittest. Reason or logic, applied when judgment indicates that the new is promising, acts like natural selection to pan the gold grains from the sand and insure the survival of the fittest. Imagination supplies the premises and asks the questions from which reason grinds out the conclusions as a calculating machine supplies answers.

It is the role of intuition or imagination to produce possiblities. Just as physical variations are produced by the reshuffling of the genes, so are the possibilities of cultural evolution produced through intuition or imagination (Feldman, 1974). And as with physical variations, most turn out to be maladaptive, or at least not useful, and appropriately fall into disuse not to be heard from in future generations. But, again following the parallel to physical evolution, some ideas are crucial not only to survival but to well-being. To trace the process of production, selection, and assimilation of ideas is certainly relevant to our ability to comprehend changes in bodies of knowledge.

Now let me turn to the second aspect of the paper, that which attempts to deal with the importance of the arts for what Professor Csikszentmihalyi calls constructive knowledge, that is, knowledge about the self. Here again I am comfortable with the argument as far as it goes, but I think that the argument should be pushed, if one can imagine it, even further. What I mean is that there is a certain depressed quality to the message that work in the arts makes it possible for me to believe that I exist. I think the use of the term *existential* to describe this theme is unfortunate. I am not a philosopher (I hope some one of them will pursue the point further), but the existentialist idea seems to me to be only somewhat artificially applicable to this particular problem. As I understand it, the existentialist point is not to move beyond finding the meaning of the moment. There is no long-term aspiration behind the existential goal. This may be more of a semantic issue than anything else, but existential needs are not the sort I think of when I think about why somebody would want to pursue expression through the arts.

I would like to try to redirect the argument slightly, beginning with a passage from a book by Csikszentmihalyi and Jacob Getzels (1976, p. 246) about creativity. What strikes me about this quotation is that it purports to be about artistic creativity but is actually about any creative activity, artistic or not:

> It [being creativity] is a process by which an individual experiences a conflict in perception, emotion or thought, formulates a problem, articulating the previously inarticulated conflict, expresses the problem in visual form, succeeds in resolving the conflict through symbolic means, thereby achieving a new emotional and cognitive balance. The aim of the creative act is not to reduce a drive in order to restore previous equilibrium, but to reach out for a new equilibrium. The key to creative achievement is the transformation of an intangible conflict into a tangible symbolic problem to which the creative solution will be a response.

The process described would apply, it seems to me, in scientific pursuits, in artistic pursuits, or in any other pursuits of knowledge. It is the creative process writ large, and I quite agree with it.

But engaging in a process writ large is not how a person becomes creative. A person becomes creative in the arts and elsewhere by learning how to do something well and wanting to do it better still. This ingredient is what seems missing from the set of needs or motives described here. I would not delete a thing from his argument, but I would want to add, over and above the need to know that one exists, that there is some kind of need to be good at something, to do something well, to put one's unique stamp on something, whatever it is, and to produce something that will have lasting value (Feldman, 1976).

I would suggest that what I call movement through a domain is the missing ingredient, and that it is what occurs when a person who becomes interested in a field—it may be art, it may be something else—traverses the levels of mastery and pushes on toward higher ones. Let me suggest these steps through a domain: *novice*, a person who has just begun to try to do something; *apprentice*, somebody who decides to do it seriously enough to study with a master, somebody more advanced than he or she; *journeyman; craftsman; expert; master*; and perhaps in the extreme, *preeminent contributor*. It seems to me that existential need fades as a primary motive perhaps at the point of apprentice or journeyman (although I would not want to try to be precise about this).

What I am trying to suggest is that there are motives that go well beyond the need to show that one exists; these needs have to do with the achievement of individuality, of *expression* of uniqueness. I emphasize the term "expression" because it is the motive that I think is most basic to the process. Expression allows one individual to be unique and different from every other individual. I would further suggest that uniqueness can be best expressed through a craft or discipline or special area of expertise.

This leads me finally to Professor Csikszentmihalyi's suggestions about preparation in the arts. He makes three points, and I would like to respond to two of them. I think it would be hard to disagree with the first one—that the things a person learns should be *relevant* to his or her experience. It is the second point on which my two lines of argument will focus: the *variety* of skills one is supposed to learn. Here there seems to be a push for doing as many and as diverse things as possible.

My own way of thinking about these same issues leads me to somewhat the opposite conclusion. It is not so much the experience of doing a diversity of things that is crucial; it is finding *that* thing, or those few things, on which a person can most productively focus his or her energy. It strikes me as ironic that I would make this point since so much of Professor Csikszentmihalyi's earlier work deals with individuals who seem to have gone through just this process I have been trying to outline; namely, finding something so compelling, so totally interesting that it becomes the focus and source of meaning for their lives. In terms of preparation for this, I would like to think that we are once again dealing with semantic issues and that Professor Csikszentmihalyi would agree that what we would really like to see happen, if we only knew enough, would be to find out what individuals are preordained, pretuned, inclined to want to do, then to provide the resources and the context within which they could work with masters more learned than they, so that we could learn whether this is indeed the kind of pursuit that will give unique meaning to our lives. Once this was accomplished, the next step would be to find the means to assist each child to move through the levels of his or her domain at an optimal pace.

I think that these activities reflect more than an affirmation of one's existence. We do not need the arts to exist. Destructive activity works just as well, as Professor Csikszentmihalyi himself points out. I do not think that his proposal to change the reward system from concrete to more symbolic rewards is likely to solve the problem for us. It would much more likely be solved through the study of the domains themselves. Calling them "arts" or "sciences" seems to me such a crude beginning to the understanding of what it is that is involved.

If I were to frame a conclusion, it would be in this form. Recognize and acknowledge that imagination is crucial to survival, yet also recognize that it is only useful to be imaginative when a person has mastered a craft. At that point, a problem may become truly problematic, and the need may come to transcend the paradigm, to go beyond.

Whether or not the educational process for which I have been arguing serves the purpose of evolution remains to be seen. At the very least it should enrich and make more meaningful the lives of our children. I will end my remarks here. I hope I have not done an injustice to what I think are the very real and very important issues raised and discussed in Professor Csikszentmihaly's paper.

Medford, Massachusetts
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Howard E. Gruber

Emotion and Cognition: Aesthetics and Science*

Before I begin I want to mention the Mountain View Center for Environmental Education, operated by Frances and David Hawkins in Boulder, Colorado. In this demonstration school there is a very special blending of concern for aesthetic feeling and cognitive activity, a devotion to searching out material that will elicit a loving and intelligent response to the world on the part of children and teachers, and a sense of teachers working side by side with children rather than over them. Their work embodies some of the goals for which I think the Aspen conference is striving.[1]

The double title of my paper, *Emotion and Cognition* and *Aesthetics and Science*, reflects the fact that there are certain issues that have not yet been sorted out. It seems to me that distinguishing among aesthetic experience, emotion, and cognition—as we have been trying to do—actually depends on a much more elaborate map of the world of experience than we now have. As matters stand, categories hammered out in one discussion may evaporate in another.

In the long run, I am sure we will want to have a map of the world of experience that will enable us to make some categorical decisions. The best thing to do for the time being is to explore experience a good deal more than we have done, in ways that enter deeply into genuine material—as Jeanne Bamberger demonstrates so beautifully in her talk yesterday.

In a way, this paper had its beginning in the summer of 1975 when I was working on my case study of Piaget. I came back to Geneva from Paris, where I had seen an exhibit of Max Ernst's paintings that had excited me tremendously. Just before going to bed I looked over the

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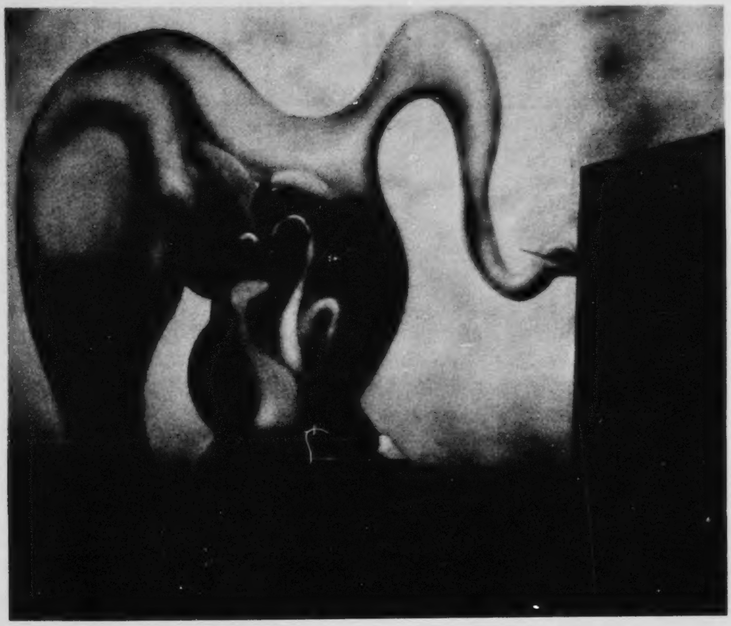
H.E.G.



Max Ernst, *Surrealism and Painting*, 1942. Private collection

catalog[2] of the exhibit, and there I saw a painting that in fact had not impressed me very much in the museum. But the little print in the catalog knocked me for a loop. It shows a collection of viscera—something like a stomach and Lord knows what else, all red and pink and threatening. Coming out of all that is some sort of entrail or intestine, all this on the left-hand side—heavily emotional. As it moves over to the right, it transforms into a hand holding a paint brush. And on the right there is within the painting another painting that is rather formal and definite—quite cognitive. I remember being very impressed by that, and going to bed, and then jumping out of bed thinking, "My study of Piaget must make that connection!"

I was using the picture to tell myself: In studying the work of a scientist, especially one like Piaget who for a large part of his life has been particularly abstract and formal—abstract in his behavior and formal in his intent—it is easy to lose sight of the emotional substratum of the person's life. He himself does many things to conceal it. This is part of the game, part of the canon of our disciplines. And yet if you want to understand what is happening, you need to know that emotional substratum.

This need not mean that we must approach scientific creativity in a psychoanalytic vein, reconstructing early childhood on the basis of adult memories. There is another range of questions: What is the panorama of feeling, the spectrum of emotions appropriate for talking about cognition? Psychologists have not looked seriously enough at such emotions as the *love of truth* to be ready to talk in a differentiated and intelligent way about the relation between emotion and cognition. This gap in our work becomes a pressing problem when we approach the task of understanding a creative person at work.

You may ask why we approach the subject of scientific creativity through the case-study method, and what bearing this work can have on cognition and the arts. My most remote and general goal in this effort is to clarify the role of the individual in history. More specifically, I would like to be able to make some contribution to rescuing the idea of greatness. In the quasi-sociological onslaught against the great man theory of history, what has been lost sight of is this: if nobody is great, nobody is anybody. If these people who seem to have made such wonderful and magnificent contributions are nothing but the vehicles of inescapable historical destiny, then what can be said of the rest of us? To believe that you and I have a role to play—some responsibility for the future—is to believe that others have a role to play, too. So, through an exploration of the idea of greatness, I hope to rescue something for Everyman and Everywoman.

Coupled with this attitude toward greatness is an attitude toward determinism. In the study of creativity, if you want to say that the individual means something, you must be anti-determinist. You must not accept the idea that depersonalized historical forces determine everything. You have to find some other way through the philosophical maze, a way of leaving room for the individual to make his or her own decisions, inventions, constructions, a way to make a difference so that if this person or that one had not existed, something would not have happened the way it did. The individual matters.

I would also like the study of creativity to benefit another enterprise, which is a pedagogical one—helping people to think better. In Newark, a number of faculty members from several neighboring institutions are working toward that end in a concerted and deliberate attempt to devise means of altering university and secondary education to help people to think better. It does seem to me that looking at the creative process in very great and creative individuals will bear some fruit for improving education in its most central task of fostering cognitive development.

My students and I have taken to calling our work the "evolving systems approach" (Gruber, Moore-Russell, Burns, Pawlowski, and Wallace, 1977). This simply means taking a look at each individual as a system of psychological processes, functions, and contents—as a system of interrelated components—and trying to understand how that system operates. We do not entertain any preconceptions that all creative systems (persons) are alike, but we hope only to devise ways of doing a sort of systems analysis of the individual. We take seriously the notion that some things the person does are influenced by some of the other things that he or she does. There is much to be said for remaining sensitive to the interrelationships among all these components rather than following the more conventional path of experimental psychology, fractionating processes down to components that can be examined singly in the laboratory with highly controlled procedures.

Coupled with the evolving systems approach is the idea that we ought not to expect to make inductive generalizations about individuals. Everyone is indeed different. Each case may help to make its special point. The special point may have some bearing on other lives, but we do not expect that we can generalize easily nor do we assume that finding out what creative individuals have in common is the ultimate goal. I certainly do not think that an *n* of two cases, or even of ten, adds a great deal to our inductive base as compared with an *n* of one. We are not going to arrive at warranted inductions by taking a random sample of geniuses.

Understanding the creative process and treasuring the individual who exemplifies it are particularly pertinent to the field of aesthetic education. Both the child and the teacher need to understand the creative process, and they need to understand it both as makers and as appreciators. The simple idea that it may take some time to do a piece of work, or that it is all right to crumple up a piece of paper and throw it away because something is not right, or any of the other things that we say easily when we are talking about an artist or a scientist trying to be creative—these are things that the child and the teacher need to understand. The notion that you should step back from your work every now and then, and not just keep your nose in the paper all the time you are drawing is an idea of that kind. Now some of these things, you might say, are very natural. There is probably a natural psychology of creativity that people invent as they go along. But we might be able to help them to perfect it and to grasp it more effectively if we ourselves understood the creative process better.

I was struck by a remark in Csikszentmihalyi's paper: "It is mainly through art that men can share each other's lives and thereby expand their own experiences while achieving a psychological integration with the species" (Csikszentmihalyi, this volume). Sharing is an indispensable goal if we are to move toward full humanity and a good life. Dinnerstein (1976) discusses some of the fundamental human conditions for this sharing. And one of the roads in that direction is traveled only by taking a deep and intimate and loving look at other people's lives. It does have to become a loving look. You cannot look hard enough and long enough at someone else being creative—long enough to understand and to assimilate all the many sides of the process, extended over time as it is—unless you really enjoy the subject. I ought to say that I did not know this when I began my work. I was not particularly enamored of Darwin. I had read and had believed that he was a rather dull and neurotic person. But I divested myself of those feelings as I went along. In my own case, I began in a spirit of curiosity and discovered a very real affection. It works both ways: the goal of sharing experiences with others is an essential one no matter whether we strive to assimilate their experiences or to share our own.

In my own work and in this paper, I do focus on the individual. But I am sensitive to the criticisms expressed during the Aspen conference of the extreme individualism that one may fall into in focusing attention primarily on individual creativity. We have to understand the individual, the kind of individual we are now talking about, as a purposeful person whose purposes evolve over time and whose purposes form a manifold—a network of enterprises. On the one hand, it may be true that each of these enterprises is one that the individual shares with others in the sense of a Kuhnian paradigm (Kuhn, 1962); on the other hand, it is also true that the network is individual, that each person is a unique nexus of a wide variety of activities, which he or she shapes into a particular form and pattern. Gruber and Barrett (1974) contains a more extended examination of this interplay between person and paradigm.

This perspective provides a way of preserving both the sense of individuality and the sense of sharing. Taking a deep look at the individual permits us to understand the pattern of sharing and to see how through that patterning an individual emerges. A careful and unflinching look at the individual shows that he or she is, in fact, very profoundly both a social being and a unique individual. In my own work, in *Darwin on Man*, I did treat Charles Darwin very much as an individual, thinking alone. During the fifteen months or so forming the central period with which the book deals, he was really alone in the privacy of his notebooks, in the sense that he was not sharing his ideas with other people. He was not leading a reclusive life: he lived in the middle of London and he was very much the lion of the scientific hour and deeply involved with other scientists and naturalists in a variety of ways. But the thought process in question—the development of the theory of evolution—was something for which he carved out a protected and very private niche during that period of time.

Jean Piaget is my next case. When you look at his life, you see an entirely different pattern. It is a fascinating process of constant collaboration, and it is interesting to explore the way in which that pattern changes over time. Here then is a neglected aspect of the social basis of science: the particular pattern of social activity that characterizes the individual's work.

In a cognitive case study, what interests us is the growth of a work over time. In Piaget's case, it would be more appropriate to say the growth of a set of works, of an *oeuvre*. That leads to a more general question—the shape of a career, an issue that Stanley Madeja brought up during the conference. I learned something important at this conference. Up to now, when I approached the study of the growth of a work, my main orientation was toward regarding the purposeful person as making the work and continually changing it to suit his or her purposes. That is one useful way to look at the matter. Another way was expressed a number of times at the conference, probably as a reflection of the fact that it was a conference in which art was the central theme. And that is, that one stage of the work becomes an object to which the person, the creator, responds, so that with the creation of that stage of the work he or she has changed the world in which and to which he or she is responding. The creator is not responding to himself or herself. He or she has objectified something that was internal, and by so doing has changed his or her own world. Perhaps I treated Darwin in that way without quite knowing that I was doing so. It was good for me to come here and find that out.

If I could summarize the general method that we try to use, it would be something like this. We try to take a look at the person—the cognizing individual, the person trying to do science or whatever he or she is about—as a whole. What is the whole set of enterprises the person is engaged in? What is the whole ensemble of the person's ideas at a moment in time? We try to conceive of that ensemble as a structure with a large number of interrelated parts and also some incoherences—some things that are not clearly connected with each other and some paradoxes. We try to understand how that structure taken at one moment in time has within it certain potentials for growth arising from these incoherences and contradictions. We try to follow how the individual in his or her work moves from that structure to another moment in time when another structure prevails.

I do not mean to say that the creative person is constantly inspecting himself and thinking, "Well, let's look the whole thing over and see how to change it." That can happen sometimes. We are, after all, talking about self-conscious individuals who have the capacity to look at large segments of their own lives and their own work, and to try to put things together in a new way. But even when things are going along in a more workaday sense—when just reading a journal, for instance, or recording an observation for the *n*th time, or going out to the greenhouse and looking at a plant, or surreptitiously making notes on the behavior of a child, or when doing whatever it is they do—somehow through the repetitive, sometimes very routine activity of this structure or of some part of it . . . it evolves (Gruber, 1976-1977).

People are not always searching for great ideas or for the "New Great Idea." Sometimes they are just doing very ordinary things. That is one of the operating characteristics of a structure. The important thing, then, is not simply to describe the structure of the moment as a static entity, but to describe it as a structure with certain operating characteristics and to understand how, through its own operation, it grows and changes. Those operations may be at a very mundane, detailed, minute level, or they can be panoramic in quality, self-consciously looking over the system as a whole.

In a sense, the main result of our work so far is the understanding that it takes a great deal of time to do creative work. I am not talking about the time in a day, although that matters too, but about extents of time over weeks, months, and years during which creative processes develop. We need to ask what goes on during that time. One way of describing events is to say that the individual is unpacking the extraordinarily dense structure of his or her ideas. The concept of density (as referred to in the paper by Anita Silvers in this volume) is particularly pertinent here. Every idea seems to be packed with every other idea. The mind forms an infinitely complex network so that when you look inside one idea you discover a large part of the remainder of the person's intellect. And when the individual does that to himself or herself, the same thing happens. One result is that the individual is constantly struggling to discover new configurations, more manageable ones, and is frequently disoriented by the very fact that he or she is living inside this very dense structure.

Another consequence of this involuted complexity is the danger that the individual may too easily go off on a tangent. Such a capacity for deviating from a previously chosen path is necessary if the person is to exploit fully the very surprises and new problems being created or discovered. On the other hand, such deviations must be kept within bounds or they will destroy the organized activity that makes creative work possible. I will take one example from Darwin's life. In order to develop the theory of evolution by natural selection, he had to make some assumptions, such as heredity—the idea that like breeds like or almost like. He was very well aware of the fact that he did not have an adequate theory of heredity, since he knew neither how it is that like breeds like nor how it happens that from time to time there are changes. What is the mechanism of transmission of likeness and what is the source of variation? He was painfully aware of his ignorance. He struggled with it all his life. At the same time, he kept the struggle within bounds. He made a conscious decision that this struggle would not destroy his main effort, which was to develop a theory of evolution founded on the *premises* of heredity and variation. In other words, he had in his network of enterprises, in his ensemble of purposes, a regulatory system that kept him on the pathway to productive achievement.

In the remainder of my paper, I want to talk about these regulatory mechanisms. Once you understand the complexity of the individual creative system, the question that really does arise is, What is it that regulates the system so that it can move steadily in a direction and achieve something? Notions like versatility and divergent thinking do not really help us to understand how the person gets anywhere, how he or she conducts his or her life in such a way that a coherent pathway and a visible product emerge.

In dealing with these problems, then, the individual does develop and does elaborate a *network of enterprises;* activity takes place within this network; the person does know when he or she is engaged in this activity or in that one. Moreover, the person orchestrates his or her own life, managing these enterprises to carry out the set of purposes expressed in the network as a whole. One of the great pleasures of the creative life must be the orchestration of purpose in just that way.

A second regulatory mechanism, one of a different type, is something I have been calling *images of wide scope*. This topic is discussed in "Darwin's Image of the Tree of Nature and Other Images of Wide Scope" (Gruber, 1978). My main point is to widen our perspective on the study of imagery. Psychologists in their by now voluminous and still burgeoning studies of imagery have dealt almost entirely with concrete images such as Francis Galton's breakfast table, or your mother's face, or the pencil before you. You shut your eyes and visualize these things.

But in the rest of our intellectual lives we know well of another sort of imagery. In referring to it we use such terms as *image of man, image of nature, image of woman*, and *image of society*. We use terms like that readily. They are not mere rhetorical devices. They reflect genuine psychological reality. In the paper referred to above, I described some of Darwin's images of wide scope, and together with my students I have been exploring such images in less eminent individuals. We have found that it is really very easy to get some people, not everyone, to talk about their images and that we can find out quite a lot about them. It is very exciting work, and I have already learned something important from it. When beginning this work, I was still very much addicted to the idea of one great image. (I guess this comes of having been raised in a monotheistic religion.) In my case, it was Darwin's image of nature as an irregularly branching tree.

As time went on, however, and I looked more deeply into the subject, I realized that each person already has or can generate a number of these images and that a pluralistic approach is much more appropriate. This pluralism has a very particular virtue: each image that the person uses can be exploited in a specific way to bring out specific features of the concepts that are being elaborated. The subjects themselves, in our interviews with them, are quite clearly aware of distinctions between images and concepts. When we invite the subjects to discuss the different modes of representation available to them and to talk about the relations among them, they ask, "Which is it that you mean?" That is, they want to know if we are referring to images or concepts. Of course, there is a complex interplay between images and concepts, and there is no simple answer to such questions. At the moment, we are exploring the interrelationships among different levels of experience, different types of representation. The exploration is still at a rather early stage because, although many people have written about this or that kind of representation, we do not have an adequate map of the many varieties of representation and the relations among them.

It is very obvious when you look at these images of wide scope, either in talking with living subjects or in reading Darwin's manuscripts, that they are definitely aesthetic objects. Darwin draws and redraws the tree of nature over and over; sometimes it is a delicate tracery, sometimes it is done with a broad brush. You can see from his remarks that he has an aesthetic feel for his efforts. For example, next to one of his tree diagrams he has written, "Tree not good simile—piece of seaweed endlessly dividing (would be better)" (Gruber, 1978). The diagram is hardly more than a few gentle strokes of the pencil, evoking a feeling of indefiniteness, endlessness. In other tree diagrams, as when he is exploring the joint processes of speciation and extinction, he draws with a firmer hand, expressing his search for precision in these quasi-mathematical musings.

Now finally, I want to talk about the subject of feeling, and in closing to quote something from an early work by Piaget. Psychologists have been egregiously remiss in the way they have approached the whole subject of emotion. On the whole, what they have done is to flee from it. If you look in the typical introductory psychology textbook, you almost always find a chapter about "motivation and emotion." This chapter represents about one-twentieth of the book; two-thirds of the chapter is given over to the subject of motivation; the part on emotion is largely given over to physiological correlates of emotion; and almost the entire discussion is about negative emotions such as anxiety, anger, guilt, and fear. There is almost no elaboration of the positive emotional life of the individual. Words like *hope, happiness, contentment, joy, pleasure, amusement, compassion, love of truth*—these are not terms that occur very often in the deliberations of modern psychology. *Curiosity* has, to be sure, had a recent vogue, but it has been treated as an "exploratory drive," not as a state of feeling. Occasionally, of course, a writer protests and will say something pertinent, but it is not well worked into the subject of psychology.

We need to do something similar to what Jeanne Bamberger does in her paper in this volume: we need to map a domain of experience in more than one way, then to look for the coordination between maps, and finally to make the point she makes, that it is this coordination that is the most important thing. Suppose we were to try to do that much for the relation between emotion and cognition, especially with some interest in the positive side of life—in the feelings of the knowing person going out toward the world and trying to know it and experience it. We would really have to start from scratch.

We simply do not have a map or a way of mapping the emotional life of the individual that would be suitable for the task. When Julian Hochberg referred during the conference to a painting that in his view had no expressive quality, I just felt thunderstruck. What this must mean is that we do not have an adequately developed language for describing the expressive quality of a painting when it is low-key or conceptual; we also do not have a very good language for describing the simple feeling of well-being.

If we are ever going to get anywhere in talking about the relations between emotion and cognition, we will have to go back into the subject of emotion in a fresh way and study the feelings that emerge in a wide variety of situations. The feelings that would be most interesting to me are those that occur when the person is being creative, or positive, and functioning well.

We would want to do more than arrive at a taxonomy and vocabulary. We would want to understand how feelings are organized over time. Aesthetic and cognitive acts have a temporal course—a growth, rhythm, and patterning in time—which we are now learning how to study; the same must be true of the corresponding domain of experience, feeling, and emotion.

I want to close by quoting a passage from Jean Piaget's *La Mission de l'Idée (The Mission of the Idea)*, written in 1916 when Piaget was twenty years old. (A full translation appears in Gruber and Vonèche, 1977.) He was already a scientist of some standing in the world, in the field of malacology, the study of mollusks. He had presumably passed through the period of acquiring formal operations and was a master of them, but what he distinctly did not do was to plunge directly into the activity of becoming more and more abstract and formalizing his work. Nor did he plunge into the amassing of empirical data to test or buttress his ideas.

Instead of that, he went through a period of looking for what can only be called the affective bases of a scientific career. In 1916, at the height of the agony of World War I, young people in Switzerland, which was neutral, looked on in horror. The young Piaget asked himself how one could find moral justification for a contemplative life. Although the search for that justification is demanded throughout such a life, not everyone responds actively to that demand, for a full response is a very special venture. This prose poem, *La Mission de l'Idée*, is Piaget's first published expression of that venture. It was not an isolated act on his part for there are other expressions of the same concerns throughout his life. This early work represents a stage in the unfolding of one of Piaget's numerous enterprises. To try to understand the other enterprises—the logic-chopping, child-watching Piaget that you know about—to try to understand them without understanding that *this* Piaget was there all the time, a part of the same person's work, is really to miss the whole point of his life (Gruber and Vonèche, 1976).

La Mission de l'Idée has 46 paragraphs or stanzas and is divided into five parts: "Hymn to the Idea," "1914," "The Betrayal of Christianity," "The New Birth," and "The Idea and the People." The passages below come mainly from the beginning, with a little from the end. As you will see, Piaget expresses strong emotions and introduces two images of wide scope: the protean Idea itself and the lonely traveler in search of it. (The excerpts below are taken from Gruber and Vonèche, 1977.)

Hymn to the Idea

I

The Idea surges from the depths of our being. The Idea overthrows kings and priests, raises the masses, decides the outcome of battles, guides the whole of humanity. Everything is Idea, comes from the Idea, returns to the Idea. The Idea is an organism, is born, grows, and dies like organisms, renews itself ceaselessly. "In the beginning was the Idea," say the mysterious words of the Christian cosmogeny.

II

Think of the force of the idea of freedom, of the untold numbers who have fought for it, of all those giants of the Idea who have imposed on whole peoples the plans of their fertile brains. The same for the idea of country, of justice. These ideas are indestructible and yet always new. To the blind the Idea seems unchanging. Poor and cold, seen from the outside, no one who tries can grasp it all, so great is its richness, so infinite its diversity.

IV

Indignantly, revolted, the young man rejects hypocrisy, and egoism, seized by the Idea he is immensely free. This is the truly moral period of life. Later the compromises begin. But here and there a hero rises. Genius is the crystallization of the Idea in a man, the hero abandons himself to the Idea, gives vent to his rage against all that is mean, bourgeois, orthodox, conservative, in a word, reactionary.

VI

The Idea leads the world. Action is the servant of the Idea, the crude instrument with which our limited nature must be satisfied, the means toward the advent of that glorious end which is the Idea. In the words he must use, the poet expresses only a small part of the beauty within him, killing the rest. Likewise action only captures the Idea in one of its aspects, and thus destroys the beauty of the whole. Progress springs from the brains of wise men, not from the arms of men of action. The Revolution was made in Rousseau's contemplative walks and not in meetings or uprisings in the streets. When a man of action dies, his work lives on just long enough to produce a few new men of action, paler and weaker than he. When a man of thought dies, his work sets off a thousand men of action, all armed with a new strength.

VIII

The winter traveler sees the cold, still world around him, the snowflakes falling crazily. By turns he senses the emptiness and sadness of the world, feels himself filled with the painful bitterness of his solitude, is united in an immense sympathy with the snow around him, finds the calm of the idea that brings him closer to God. We fear that *our efforts may be all in vain, we do not see the ideal, but we construct it nevertheless. Such is life for the idea, painful and fecund, for to suffer is truly to live.*

The Idea and the People

XLV

The Church of tomorrow will not be a church. True communion, that of sympathy and good works, will unite believers in one identical advance toward the ideal goal. And each believer, in his most intimate being, will construct the rational edifice which best suits him, which best contains the nucleus of life his heart will feel. For every individual there will be a doctrine, and their infinite diversity and their contradictions will forever prevent living ideas from becoming automatized, or from struggling amongst each other.

XLVI

. . . The special mark of each man must be his idea and from these ideals, numerous as the cells, the true idea will come forth, like the soul from the body. . . .

Newark, New Jersey
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NOTES

[1] See also the magazine, *Outlook*, available from Mountain View Center for Environmental Education, University of Colorado, Boulder, Colorado, 80309.

[2] *Max Ernst*. Catalog published by Centre national d'art et de culture Georges Pompidou, Musée national d'art moderne, 1975.

Michael J. Parsons / *A Response to Gruber*

A Discussion of "Emotion and Cognition: Aesthetics and Science"

First, I'd like to say that, thanks to this Conference, I have taken the chance recently to read Howard Gruber's book on Darwin (*Darwin on Man*, 1974), and I much admired it. I have read the two other papers he distributed at the Conference; and in addition, he gave me an overview of some of the points he discussed in his paper. As a matter of fact, he gave me a whole set of points, more than he has included here; and I found all of them interesting and stimulating, so much so that I am uncertain which to pursue. It reminded me a little of the anecdote he quotes in his book on Darwin. It seems that Darwin in his early days, when he was at Cambridge, had a passion for entomology, and in particular for collecting bugs. One day, when he was out in the field, he found two new bugs at the same time, and put one in his left and one in his right hand. Before he could put them away, he saw still a third, and in his excitement not to let it get away, he put it in his mouth. Well, Howard gave me a point for the left hand, and one for the right, and several in addition, and I have tried to select one to put in my mouth here. I hope it does not come out with the acrid taste that Darwin said his bug had.

One of the things I liked about the Darwin book, and about what Howard has said, is his stress on understanding creativity as a slow constructive process over time. He emphasizes the importance of the context, the preparation needed for any moment of insight, the slow transformation of problems, the complex interplay between new and old ideas, and so on. All this is refreshing to someone from the world of education where creativity is too frequently construed in terms of the number of uses for a housebrick you can think of in thirty seconds.

Howard's stress on creativity as a slow and complex business goes along well with his interest in motivation. He is one of the few people at the Conference to show a great interest in emotions and their connections with cognitions. He insists on the need for strong interests

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and commitments on the part of the learner if he or she is to be creative, if he or she is to stick to business long enough to produce something worthwhile. He cites Darwin's delight in nature and his early passion for collecting insects. He points to the importance of the positive emotions such as joy, curiosity, hope, love of truth.

What I would like to do is to take a third notion in what Howard said and to pursue it a little bit further. This is the need for regulation or self-guidance in the long and complex process of creativity. It also seems central to his view of creativity, especially if we are interested in the creativity of children, as distinguished perhaps from that of great scientists.

In an account of a process of this kind, there is a need to speak of self-guidance and perhaps self-judgment. In a sense, it is a process that still has to invent its goal; but in another sense, it is clearly goal-oriented. It is certainly not random. There is some sense, perhaps unarticulated and intuitive, of where one is going, of what may be relevant and what may not. At many points in the process, there will be choices to make; say, whether a particular case is worth brooding over any longer, whether and where to look for more evidence. And to make choices one needs some criteria, however tentative and intuitive. At another time, one may be stuck on a particular problem, unsatisfied with available solutions, looking for another. One does not know what the solution will be, but one needs a sense of what kind of thing it would be like, what kind of element it would include. Or there are moments of insight, which David Perkins redescribed for us in his verbal response to Howard's paper as cases of pattern recognition. One of the nice things about that description was that it revealed some important overlap between moments of invention and moments of criticism, since both are cases of insight depending on pattern recognition. One is recognition of a new pattern, one is perception of inadequacy in an old pattern. Both are equally cognitive and intuitive or, if you like, "affective." Something of the same thing applies to creativity and criticism in general—not just that both are necessary, but that in important ways they are not really different. At any rate, mechanisms of self-regulation are an integral part of creativity, and self-regulation must be critical in spirit.

Howard Gruber mentions two interesting regulatory mechanisms in his paper: one is the individual's "network of enterprises," each enterprise perhaps shared in common with others, but the combination being unique to the individual. A second is the concept of "images of wide scope," which, as he suggests, may have something to do with aesthetics. I will suggest a third, one which in a way his study of Darwin and his paper take for granted, but one which perhaps cannot be taken for granted when we are thinking about the education of children. In its most obvious form it is the "sense of a discipline" that comes with mastery of a body of knowledge and the methodology by which it has been acquired. In Darwin's case, of course, he had mastered biology. He had served a long apprenticeship as a biologist, which no doubt gave a certain structure to his thought and feeling. I do not mean to stress just the cognitive, the knowledge aspects, of being a biologist. I mean to stress the subliminal ways in which a mastery of biology would affect one's feelings, one's intuitions, one's sense of what may be relevant, and the emotions such as those Howard talked about: curiosity or love of truth, for example. One's love of truth is surely structured by one's conception of what truth is.

Consider the excitement of Darwin when he found three apparently new bugs in succession one morning, and popped the third into his mouth. Not everything about that bug was important to science. His excitement was cued by a sense of the kind of feature that might be important, of the kind of connection that might be established between this case and many others. More generally, in the long process of his creative achievements, Darwin's sense of what was anomalous and hence a problem, and of what might be a new solution or a flashy but insufficient answer, was structured against a secure intuitive feel for what was normal or traditional in biology. This, of course, is what school children do not have, and so it is presumably what educators should also be concerned with if they are to help learners to be creative.

If we try to apply this to the arts, the situation is not so clear since there is no obvious or undisputed "structure of the discipline," no clear-cut criteria for what is appropriate like those in biology. But there is a difference between acquaintance with and sophistication in dealing with the kind of response normally thought relevant in the arts, and the absence of this kind of knowledge or exposure. I have put this rather vaguely; I mean to say there is relevance and irrelevance in talking about art, and one can have more or less of a sense of that relevance. Moreover, children do not naturally have this sense of what is relevant. Jeanne Bamberger (this volume) gives us some good illustrations of this in her discussion of what children notate and perceive in music; for example, her second rhythm notation case did not see duration as relevant. Gil Lazier (another Conference participant) has spoken of his research into what children at different ages find to be relevant in theater productions, and he finds it is not always identical with what adults find relevant. In my own work, while talking to children about paintings, I have found systematic interference of irrelevancies; for example, for many children a moral disapproval of boxing gets in the way of a relevant response to a painting of a boxing match. I believe, in fact, that as children interact with the various arts, there is normally a progressive development of this sense of what counts and what is discounted. If I am right, this developing sense of the aesthetic would be another important regulatory system in the life of a creative artist. And the creativity of a child would be very different from that of an adult artist, just because it is unregulated in this way.

To conclude, I hope I have taken one of the thoughts in Howard Gruber's stimulating paper and turned it a little toward a closer application to children and education, and possible researches.

Salt Lake City, Utah
January 1978

Julian Hochberg

Visual Art and the Structures of the Mind*

Introduction

Perceptual psychology and pictorial art have long been intertwined. Psychologists have repeatedly used particular aspects of pictures as their starting point for perceptual inquiry and explanation; and artists have leaned, with more or less good judgment, on perceptual theory to help them technically and—more often—to justify their idiosyncratic methods and personal styles.

I am going to distinguish three broad functions in visual art: representation, by which I mean the use of visual displays to convey information about the physical disposition of objects, people, and events; expression, by which I mean the communication of feelings and identity; and aesthetic value, by which I mean the beauty, rightness, or "intrinsic interestingness" of the work of art. Usually, these last two functions are lumped together, but I will find it useful to separate them. Each of these three functions is significant to the educational process, broadly defined, in an important way. In each, there is what may be considered an unlearned component (meaning that the perceiver does not acquire it from experience, but is either endowed with that ability by innate prewiring or by experience with the real world) and almost limitless elaborations by way of learning.

What makes the arts (and arts research) particularly important to the educational process is that most of our natural learning occurs by context, and in the normal course of growing up in one's culture the unlearned components (in the sense that I just defined them) provide the context for a great deal of learning of the learned material. It is for this reason that I may sound a little impatient from time to time in what follows with both those theorists who proclaim that all is learned and arbitrary, and with those to whom all perception is nonarbitary (that is, either innate or learned from the world as distinct from artistic

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*This paper was adapted by the author from a speech he delivered at the Aspen Conference, and therefore it is not accompanied by a response.

invention or convention). We shall see that both components exist; both are important to an understanding of general education; and empirical research (rather than philosophical judgment, authority, or sensitivity) is needed to explicate them and their relationship.

I will discuss each of the three functions of visual art in turn, relating them to the major theories of perception that have been concerned with them. There are essentially four such theories, whose development has followed a spiral course: now relying heavily on cognitive explantions, now denying their necessity, and then again returning to them. At present, there is strong support for the existence of mental structures whose characteristics are fundamental to the perception of the world and which can be studied by studying visual art. Such mental structures are clearly of vital importance to any theory of education—if they really exist. We need to know their place in a general theory of knowledge, but I will not attempt to discuss that here. I do want to look at each of the three functions of visual art—in their social context, where possible—to see what research issues are raised by the assumption that mental structures are intimately involved in those functions.

I will try to use a nontechnical vocabulary, but some of this discussion will necessarily be technical in substance. So much for introduction.

I. Representation

The first function to discuss is that of *representation*, and I will spend most time on that function, because it is really neither artistically nor socially nor psychologically trivial, and because in seeing why that is so, we will find that perception depends on mental structures that must also underlie more generally the expressive and aesthetic functions of art.

The first approach to representation—as distinct from communication about the artist (expression) and from the making of works of "intrinsic" value (aesthetics)—was *noncognitive* and involved the production of surrogates.

The Production of Surrogates

Figure 1 is a sketch of a pursuit best epitomized by Leonardo da Vinci's prescription of what we now call the monocular or pictorial depth cues: Hold a piece of glass (1) between your fixed eye and the scene (2); trace the objects of the scene on the glass; that tracing (3), if studied, shows how to represent depth and distance on a flat canvas. In fact, if you examine (3), you will find there what are now known as the cues of linear perspective—relative size, familiar size, interposition, texture-density gradient, and so on—psychologists' names for what artists had noted as the "signs" (really not a good term) of depth. With this geometrical vocabulary of depth cues and with a knowledge of how to mix colors, we can prepare *surrogates*, which are defined by

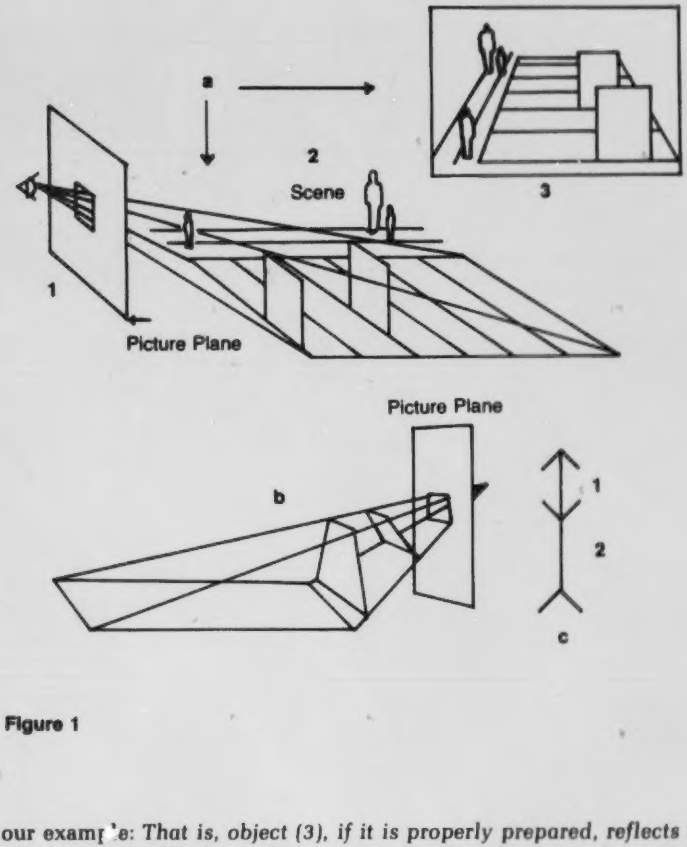

Figure 1

our example: *That is, object (3), if it is properly prepared, reflects the same pattern of light to the viewer's eye that the scene does, IF the viewer's eye is at the right point in space relative to the picture.* This is a very important proviso. We will return to it later.

What does psychology have to contribute to this task (or to learn from it, for that matter)? Very little, once it has told artists how they can best mix their colors.

Also, once the camera has arrived, the artists themselves become unnecessary for this aspect of the task, which means that in principle the process of making representations can be considered an automatic one—*at this level.* (We will see that there are other, and more important, levels to be considered, so this conclusion—although many psychologists believe it to be true—is unwarranted.)

Actually, even at this level, the problem is a little more complicated than that—because since the lightest pigment can reflect only about forty times as much light as the darkest one, the light produced by a surrogate object such as a painting covers a much lower range than that which is produced by most scenes. For this reason, an artist who understands the laws of color contrast and chiarascuro can usually do better than a straight, high-fidelity photograph of the scene; but this is a relatively minor point, and psychology does not enter the picture in a serious way via this route (although later we will see how the Impressionists and their successors have built the psychologists' laws of color contrast and color mixing into their own rationale).

Nevertheless, psychologists and philosophers have had a great deal to learn from the fact that such representations can be made by the procedures of *Figure 1a* and can work, as we will now see.

What Surrogates Were Thought to Imply about Mental Structure

The Basic Facts of Ambiguity: The fact that a surrogate object, (3) in *Figure 1a*, can act as a substitute for a scene (which is a very different object or set of objects) means that our visual information about the scene, and about any picture, must by its nature be ambiguous. In *Figure 1b*, we see why (and how) many different shapes can produce the same picture and present the same pattern of light to the eye. This naturally raises the following question:

Why Do We See the One Scene that the Painter Wanted Us To? That is, if a picture—like the one in *Figure 1b*—can be a surrogate for a large number of different scenes or objects (in fact, an infinite number of different arrangements will produce the same picture), why does our eye see only one, and why the one that the artist had in mind for us to see?

The Classical Psychological Theory from Berkeley to Helmholtz: The answer is asserted with conviction by most art theorists, by many philosophers, and by those laymen who think about it: We have learned the spatial meaning of the depth cues from our experience with the world, and scenes have certain normal characteristics (i.e., parallel lines converge, most angles are right angles, and so on). So, by perceptual habit, we perceive that object or scene that would *most likely* be producing the light that reaches our eye.

Of course, if we follow this rule, our perceptions of the world will be mostly right. Sometimes we will be wrong. Consider *Figure 1c*, which is a classical illusion (the Müller-Lyer figure): the upper length (1) is exactly equal to the lower length (2). An explanation that is popular among classical psychologists (whose writ extends most strongly from Bishop Berkeley in the eighteenth century to Herman von Helmholtz at the threshold of the twentieth, but whose influence is still around and even gaining in strength again) is this: The slanted lines are taken by the eye to be the *depth cue* of linear perspective; therefore, (1) is taken as being nearer than (2), for example, the outside corner of a room as opposed to the inside corner of a room. Because the two lines are the same length on the page and in the eye, the one that appears to be nearer must also appear to be smaller. (If this sounds as though I have made a mistake, I have not; think about it while you consider *Figure 1b.*) So, we see *Figure 1c* incorrectly because most of the time the diagonals really would be the result of linear perspective. It is a primitive picture. And in general, we see depth in pictures because that particular kind of an object (pigment on canvas, ink on paper) is really less frequently encountered than real scenes and objects. If we had as much experience with surrogates as with the things they represent, the former (that is, pictures/surrogates) presumably would not work.

This is the classical theory about pictures. It has a number of features that are important to the present inquiry. Notice that it is a *cognitive theory:* it assumes that we as perceivers fit our sensory patterns to the ideas we have about the world (that is, to our mental structures) and that to do this we must solve problems like the one in *Figure 1c.* For example: given that (1) and (2) are the same size at the eye, but (1) is nearer, which is larger? There is an implausible ring to this (technically known as the *unconscious inference from non-noticed sensation* explanation). Nevertheless, the general theory has been around for a long time. It is incorporated more or less formally in most artists' and philosophers' thought about art, and it generates one doctrine that has remarkable potential for creating error, conflict, and confusion: the doctrine that the depth cues we discussed in connection with *Figure 1a (1)-(3)* are learned arbitrary symbols or conventions, which the art culture *invents.* This is simply unjustified, as we will see shortly.

Let us turn to the next influential theory of representation.

The Gestalt Theory as an Alternative

Consider *Figure 2a.* After a little inspection, you will note that it can be perceived either as two faces looking at each other or as a vase, but it cannot be clearly perceived as both at the same time. One or the other is *figure;* the other is then *ground.* The figure has recognizable shape, is more substantial, and is remembered; the ground may contribute to composition, but not to recognition, to memory, and so on.

Artists, of course, have known of many of the effects of the figure-ground phenomenon (cf. Albers, Arp, Klee, Miro, Tschelitschef). To Gestalt psychologists, figure-ground represented the basic unit of perception. With respect to the problem of representation, this much is clear: regardless of how faithfully a surrogate like *Figure 1a* (3) has been prepared, unless the pictured object is figure, it cannot be perceived and therefore cannot be represented; and again, if two objects form a single figure (as when the flowerpot grows out of your subject's head, when you first start taking snapshots), neither of them can be correctly represented!

Which area becomes figure, therefore, is crucial in the making of a representation. And, so the Gestaltist argument ran, experience or

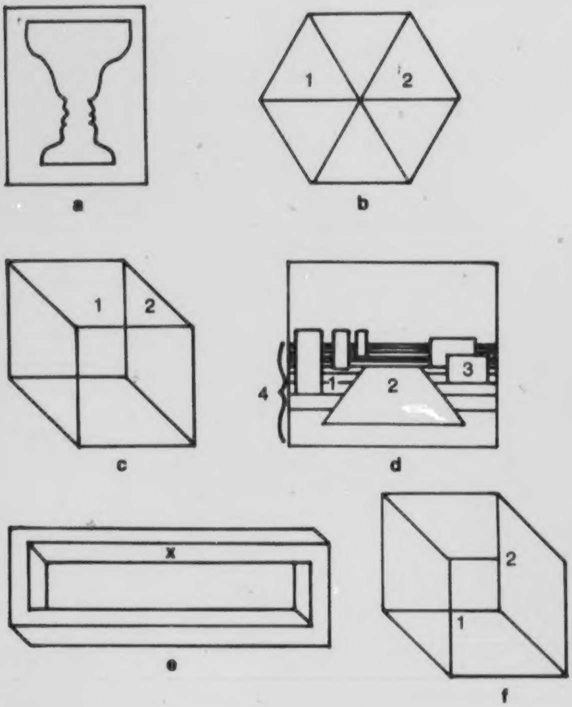

Figure 2

familiarity with the world does not help: it is perfectly possible to conceal very familiar shapes, like letters, by embedding them in lines and curlicues that have never been seen before. What does help is knowing what the laws of organization are. There are a lot of these, but they can be summarized in a *simplicity principle:* We perceive that object or event that is the simplest among the alternatives. For example in *Figure 2b,* we see a flat figure, because it is simpler as a flat pattern (e.g., only three internal lines, all equal angles) than as a cube; whereas in *Figure 2c,* we see a three-dimensional object, because it is much more complicated as a flat pattern (one has to break the sides of the cubes, as between the side of the flat triangle at (2) and of the flat trapezium at (1), and there are nine internal lines and three different sizes of internal angle). This is a very different approach from the classical one of adding cues together; here the whole organization of the figure determines the appearance of the parts.

To artists, this Gestalt approach is potentially an aid in achieving pictorial intelligibility, which can probably be formalized and made more practical than has yet been done. To psychologists, it offers an alternative to the classical idea of "mental structure" and unconscious cognitive processes. For example, *Figure 2d* is a picture that looks much like *Figure 1a* (3), as a surrogate for depth. But note that to a Gestalt analysis, neither familiarity nor depth cues need enter the discussion. In *Figure 2d* at (1), you can see either three similar rectangles of different sizes, or three rectangles all of the same size, arrayed in depth; at *Figure 2d* (2), you can see a trapezoid upright on the page, or a square flat on the pictured ground-plane, in depth; at (3), you can see an inverted "L" and a rectangle, or two identical rectangles, one behind the other; at (4), either you can see a set of unevenly spaced horizontal lines, interrupted by (1), (2), and (3), or you can see an evenly spaced texture on the flat surface of the pictured ground-plane, extending behind the other objects. In each of these cases, what we previously considered a depth cue in *Figure 1c* will now appear as a consequence of the principle of simplicity. We see the picture in *Figure 2* (d) as a three-dimensional scene and not as a set of lines on paper *because it is simpler to do so*, not because of any mental structure or cognitive processes based on past experience.

That is the Gestaltist's position and the position of the "information theory" approaches that have descended from it. It is really a noncognitive theory, and it is not clear from this theoretical viewpoint that education has any function to serve.

We will return to this point. "Simplicity" is a vague term; research (done in terms of "information theory") has progressed slowly; and before we can settle with the Gestalt alternative, we must attend to an even more anticognitive theory that prevailed in the fifties and sixties: Gibson's theory of "direct perception" of stimulus information.

Gibson and the "Higher Order" Information in Surrogates

Neither the world nor a picture of it, according to Gibson's influential proposals, needs to be at all ambiguous if we really look at all of the information that is available in the former, and in the latter to the degree that the picture is a truly faithful surrogate. Some examples of Gibson's earliest (and perhaps most pictorial) argument are given in *Figure 3*.

Remember the analysis we made of *Figure 2d (4)*, the texture on the ground plane. As an example of the kind of information that is available to the eye, Gibson points out that the *rate* at which the texture changes (technically, the texture-density gradient) in the picture plane varies with the slant of the pictured ground-plane, regardless of what the texture itself is: with very different textures, *a* and *b* in *Figure 3* have the same gradient. And the gradient of texture reveals a change in slant (a corner) at (y) in *3c*, tells us (by its abrupt change in density) that there is an edge of a cliff at (y) in *3d*, and is even informative

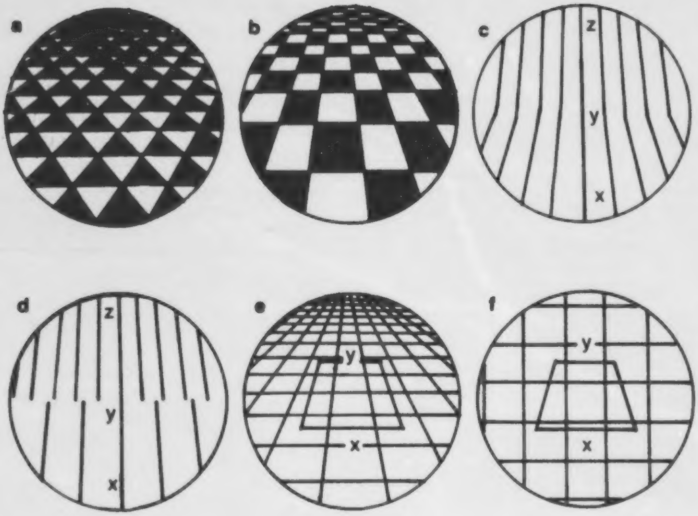

Figure 3

about the sizes and shapes of objects in the field of view. For example, we know that the shape at *3e* is a rectangle at a slant because its edges (x) and (y) are the same size relative to the texture adjacent to them; in *3f*, the shape is an upright trapezoid because (y) is smaller relative to its adjacent texture than (x) is.

With so much information available, the perception of the visual world is not a matter of learning that an arbitrary visual pattern—a depth cue—is a symbol for spatial distance; it is a matter of making a direct response to the information about the world in the light at the eye, whether that light comes from a scene or from a faithful surrogate of the scene.

If this theory of perception is completely true, there is nothing that we can call cognitive involved in perceiving pictures (or anything else). Is it valid?

In this surrogate theory of picture perception, a picture can only represent a scene or an object to the degree that it affords the same light to the eye as the scene or object does. We will see two major ways in which this formulation is inadequate, both of which will point to another and more cognitive theory of representation.

Difficulties with a Direct (Noncognitive) Theory of Picture Perception

The Effect of Viewpoint. Once you view a picture from a viewpoint different from the one from which it was traced or painted, *it must be a surrogate for a different object or scene.* We made that point with

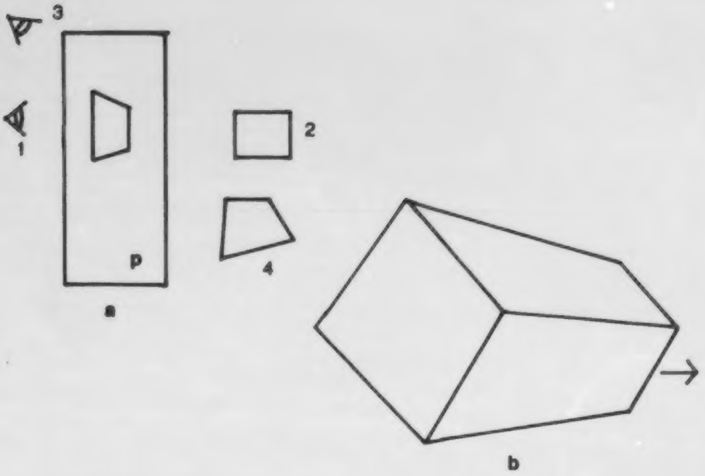

Figure 4

respect to Figure 1a; it is demonstrated in *Figure 4a:* If (P) is the picture and the eye is stationed at (1), the object that would produce that picture "normally" is the one at (2); if the same picture is viewed from stationpoint (3), the object that would "normally" produce it is at (4). A dramatic example of the effect of viewpoint is shown in *Figure 4b.* It is a primitive example of an *anamorph:* viewed normally, it is an elongated, prism-shaped object; viewed almost parallel to the paper, with your eye as close to the point of the arrow as possible, the figure looks like an upright cube, and if you move your eye to the right or left of the arrow, the cube distorts like an elastic toy. Anamorphic pictures and murals were once in tremendous vogue for architectural *trompes l'oeil* and toys. They have no serious artistic interest, and they are not important to us here except as a demonstration: *they only happen with extreme changes in viewpoint* of the sort in *Figure 4b.* Why?

One explanation is that the viewer perceives the slant and the distance of the picture itself—that is, perceives the fact that he or she is not directly frontal-parallel to the picture hanging on the wall and is not at precisely the distance that would make all the depth cues consistent—and that the viewer, after correcting the pattern that is on the picture's surface to take that distance and slant into account, proceeds to retrieve information from the corrected depth cues! That is, of course, a cognitive process, and there is by now a fair amount of evidence that something like this does in fact occur. In the case of extreme viewing angles, like those for which anamorphs are designed, the correction or compensation is very far from complete, so that the discrepancy between what is seen at different viewing angles then becomes evident.

In my opinion, the fact that a compensation process appears to be at work, even before pictorial information is taken from the picture, effectively knocks the stuffing out of a surrogate theory of picture perception and takes us back to the kind of cognitive explanations that we offered for *Figure 1c*. Although that kind of cognitive function in picture perception is interesting to perception psychologists, however, it does not seem particularly relevant to anyone else's concerns (except perhaps gallery owners and movie-theater designers, to whom matters of permissible viewing angle would be of practical importance). The effects of different distances upon depth cues have of course been noticed; they are particularly striking in the case of photographs and motion pictures in which the focal length of the camera, or the degree of enlarging and cropping a print, can radically change the relative distances from which the pictures were made and from which they are viewed. These effects have also been exploited in minor ways (cf. De Chirico). It remains a minor issue of parochial interest to perception psychologists.

Certainly this level of cognitive involvement in picture perception, even if it were absolutely firmly established beyond debate (which it is not), would have no direct implications for education or educators: the compensation process and the mechanisms that underlie it must depend on learning that is available so early and so ubiquitously that we can consider it, for practical purposes, to be an innate response (in the sense that I made this distinction at the very beginning of this paper). There is, however, another failure of any (anticognitive) attempt to consider picture perception a direct response to surrogate stimulus information that is vastly more important to artists, theoreticians, and educators. That failure inheres in the recognizability of surrogates that are absolutely unfaithful to their subjects, that are physically totally different—that is, in the representational efficacy of drawings and cartoons.

Line Drawings, Caricatures, and Cartoons: Line drawings, caricatures, and stick-figures go back as far as we have records of human pictures, and it may not be immediately evident to you how different such pictures are from the process of representation as we have been describing it. A line is a ribbon of pigment on paper or canvas; it is not an object's edge, in any physical sense of the term, nor does it contain any of the information about objects' edges that we touched on in connection with *Figure 3*. Nevertheless, picture-users throughout history have unhesitatingly accepted lines as representations of objects' edges. Moreover, they have been willing to accept patterns of lines like that in *Figure 5c(2)* as familiar objects (in this case, a hand) even though there is simply no way in which such a pattern can be a surrogate in the sense of *Figures 1* and *3;* i.e., there is no sense in which *Figure 5c(2)* produces the same light at the eye as does a real hand. (This figure is based on an experiment conducted by Ryan and Schwartz.)

It is tempting, therefore, to regard such usage as a learned, pictorial language, unrelated to more normal perception, whether of the world or of good high-fidelity surrogates. Resist that temptation: it may have a kernel of truth, but it is for the most part wrong, and quite misleading.

Line drawings—if they are at all good ones—can be comprehended by viewers who have had no experience with them; in fact, as both history and experimental research have shown, line drawings can be comprehended by viewers who have never had any significant experience with pictures at all—who have never had anyone present them with a surrogate and say "This is an apple; this is a man; this is a house." And the same appears to be true about cartoons or caricatures.

We have no developmental research on the topic of what makes a cartoon good in this sense; we will see shortly why that would theoretically and practically be an extremely important research area.

But first we need some theory about why these representations, which are not really surrogates at all, work. This brings us to what I believe is now the best working theory of picture perception, which once again is a thoroughly cognitive theory. We have come in a spiral from the classical theory of *Figure 1*, through the anticognitive theories of *Figures 2* and *3* (Gestalt theory and Gibson's "global psychophysics" or "direct theory") to a theory that is very similar to the first approach, but one which recognizes that some features of picture perception are to all practical purposes innate, and one which has important implications for educational purposes.

Impossible Figures, Eye Movements, and Canonical Forms: Schema Theory and Representation

Consider *Figure 2e* (adapted from one by Penrose and Penrose). Since its publication, it has fascinated artists like Escher and through them has papered the walls of thousands of college dormitories. Somewhat better artists, like Albers and Piranesi, have played with similar visual paradoxes. Why do they work and what do they tell us?

Their message is clear and straightforward: Only the intersection or corner that you look at directly works as a local depth cue. When you look at one corner, the other falls so far from your center of clear vision (called the fovea) that it is without effect.

Is this something that is unique to such abnormal pictures? No. Consider *Figure 2f*. The intersection at point (2) is chosen so that in order for the other intersections to be consistent with it, the vertical line at (1) must appear to pass behind the horizontal line. In fact, if you keep your eye fixed on point (1) for a few moments, reversals will occur, and the vertical line will periodically appear *in front of* the horizontal line. This is, of course, inconsistent with the intersection at (2); the figure is not an impossible one in any way (in fact, it is of exactly the same class as those with which the Gesalt laws were explored and demonstrated; for example, *Figures 2b* and *2c)*; and it is a simple and direct demonstration that the whole does not determine the appearance of its parts. Since that is precisely the premise on which Gestalt psychology rested, we have also put a belated end to that theory. Gestalt theory, useful as it may have appeared when it was first introduced, is really basically wrong, and it cannot explain the perception of objects and scenes, even though we seemed to be making a good case in connection with *Figure 2a-d*.

Figures 2e and *f* are more than destructive examples. They raise a fundamental fact of vision that we have simply ignored until now: we see detail only with a very small part of our eye—the fovea, which is roughly the area covered by your thumbnail when you look at your hand with your arm half-extended. Normally, you look at any scene with a few glances that were directed to some points that had first been seen with the very vague, undetailed vision of the periphery. That is, you use your fovea for obtaining samples of detailed vision by means of eye movements called ballistic saccades—throwing your eye to a series of places that you examine for detail. This is clearly a purposeful activity and a marvelously well-practiced one: approximately four times each second, for much of your waking hours. For many years, critics of the noncognitive, direct theories of perception have cautioned that perception is a motivated, purposeful activity, and that such theories were ignoring that fact. We now see that perceptual purpose is not merely a metaphor: we literally cannot perceive without the purpose of taking the successive glances that enable us to assemble our view of the world.

The difference between foveal and peripheral vision has more interesting artistic uses than those made by Escher: Rembrandt, Eakins, and Monet have used the low acuity of peripheral vision, and the successive nature of how we assemble our views of a scene (or of a painting) in skillful and important ways which cannot be taken up now. The perceptual implications of the fact that we must assemble our glances are very great indeed, and these must be taken up, at least in bare outline.

Suppose you move your eye successively to the corners of a square to check whether they are complete. If the circles in *Figure 5a* represent your fovea, then (1), (2), and (3) represent what falls on your eye as you look at the upper left, the lower left, and the lower right corners, respectively; and what will have fallen on your fovea in those first three glances—taking no longer than three-quarters of a second in all to execute—is the superimposed mess of corners, more like a cross than a square, that is represented at (4). How do we manage to sort out the rapid sequence of successive, superimposed views of the world that our glances bring?

As you might expect, the natural medium in which to study this question is not that of static pictures, but that of the motion picture

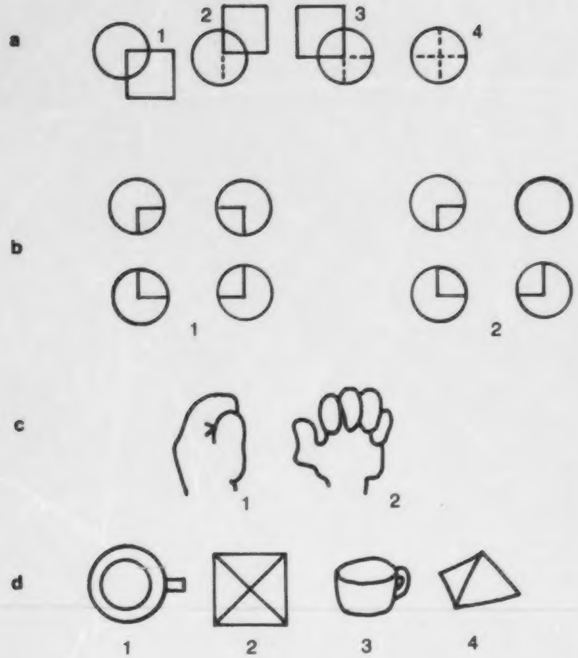

Figure 5

and video montage. In normal seeing, our peripheral vision is undetailed but wide-angled in view, offering us a forecast of what we will see in more detailed fashion if we look at some particular spot, and a reminder of what we saw there, after we have moved on. Because our foveas are so small, and because we take relatively few glances at any normal scene before we have learned what we have to from it, most of our seeing is by peripheral vision. In a succession of closeups, the peripheral context is missing, and the perceiver then indeed has no way of knowing how the succession of views relate to each other (this is particularly true in motion picture and video montages because the viewers have no reliable way of knowing how the camera was pointed from one shot to the next, whereas they normally have their own knowledge of where they have directed their own eyes to turn, and the very considerable amount of peripheral overlap between views serves to indicate where the views lie with respect to each other). What the filmmaker must do is to present *establishing* shots that provide the setting within which the successive views can take their place *if* the perceiver makes the effort or pursues the intention of using and testing the overall schema the filmmaker has presented.

In looking at a static picture, the establishing context is given by our peripheral vision and by our expectations of what we will find there when we bring any part of it to our detailed foveal vision. *Our glances at a still picture then are like a self-programmed montage,* which we will only bother to execute if we are uncertain about, and are interested in, what we will find on closer inspection of its different regions.

To perceive a picture or scene, we test our expectations of what we will find where. More formally, *perception is the intentional formulation and testing of sensory expectancies.* The key words here are "intention," and "expectancies." Intentions refer to the effort to formulate and test an expectancy. (You *can* look at a Pollack or at a page of text with no intention other than to confirm that it is a dense pattern. To see how important the intention is, try looking at a book upside down—it makes the effort of testing textual expectancies difficult and slow.) Expectancies refer to our mental structures of the objects and events in the world—how we expect the successive views to hang together. This aspect of the perception of art, and its development, is obviously better studied by the use of motion pictures of still pictures than by the use of still pictures themselves, and developmental research in this area of perception would probably have considerable theoretical and practical value (theoretical, for explicating the processes we will talk about next; practical, for learning how to improve the comprehensibility of both still and motion pictures by viewers of various ages).

Still pictures, however, can make some of the points. *Figure 2e,* for example, is a demonstration that the mental structures we formulate and test are not rigid and consistent replicas of physical objects in the world: understanding the laws that govern them requires separate study. In effect, *Figure 2e* shows a sort of failure of conservation (in the Piagetian sense) with adults, and no exploration of what Arnheim has called "visual thinking" can be pursued unless we first learn the rules (and their development) that govern our mental structures. *Figure 5b* is an example of how we can demonstrate (and study) some aspects of the schemas that we fit to the features that we sample: at (1), a square; at (2), an "L."

Most revealing and very much in need of research in this context are the uses of "low-fidelity surrogates" (cartoons and caricatures) for representation. We can now understand the Ryan and Schwartz experiment that I mentioned in connection with *Figure 5c* (the outline of a hand). I will return to it briefly and explain why I think it fits so well into a schema-testing, cognitive theory of the perception of art, and why it is an extremely important line of educational research.

What Ryan and Schwartz found was that outline cartoons of hands and bits of machinery, like *Figure 5c(2)*, were perceived more rapidly than photographs of the same objects in the same positions. Let us see why this can be so. The artist can select a set of features that identify an object and distinguish it from others: For example, the drawings in *Figure 5d(1)* and *(2)* are just as good (or bad) in terms of their fidelity as surrogates as those in *Figure 5d(3)* and *(4)*, but the features of the latter that characteristically identify them are much more evident because of the direction from which they are viewed. The artist, unlike the camera, can combine the important features of an object into a single picture of that object, even if they could not really be seen that way from a single viewpoint. Such representations of objects that are most readily identifiable, and that are in closest agreement with the mental structures by which we remember, test, and perceive them, may be called their *canonical forms*. Now we can see that even the goal of representation is not automatic, is not merely an application of the laws of geometry and physics, and is not done better by the camera than by the artist. In general, we would expect that even the most carefully posed and lighted photograph would turn out to be a poorer representation than the best cartoon, simply because the object's canonical form will not in general be identical to its physical form. This raises an issue for research that may be of the greatest consequence for nonverbal education as a process and technology.

In the natural course of learning both verbal and nonverbal signs and symbols (for example, acquiring a vocabulary), meaning is acquired mostly by context. Very little of what the native speaker learns is learned by formal definition or by dictionary work; the great majority of meanings are acquired from the place that words occupy in the setting in which they are encountered, and in this situation something pretty close to one-trial learning must occur. Learning by context means entering the situation with sufficient knowledge about the other components to define the new one. Are nonverbal signs and symbols (whether or not they are "iconic") also rapidly learned by context? Certainly theorists as different as Kepes and Gombrich appear to believe that is true. And if it is true, then identifying and providing perceptually self-explanatory context is an essential step in extending the viewers nonverbal vocabulary. If we know the conditions and limits on learning visual meaning by context, then every children's book illustration, every comic book becomes (potentially) a nonverbal teaching machine, not "merely" a representation.

The mental structures that provide a pictorial vocabulary for perception, and for the acquisition of further knowledge, are clearly prime candidates for fundamental research in education and development, as are the conditions that determine contextual learning of such structures and of the features of which they are composed.

We have introduced these mental structures in the context of the task of *representation*. Let us now consider briefly how they affect our understanding of the *expressive* and the *aesthetic* functions of art.

II. Expression

Once freed from the constraints of projective fidelity, the artist can try only to make his or her representations as readily recognized as possible, he or she is also free to maximize achievement of other goals, which may have nothing to do with representation, to make the picture *right* in ways that do not affect how well the viewer can recognize the scene, object, or person. These are the expressive and aesthetic functions of art. "Expressive" refers to feeling, emotions, and the "self-expression" of the artist. "Aesthetic," as I will use it, referred originally to beauty and to the pleasure of beholding it; now, it refers to whatever factors arising from the other two functions (representation and expression) engage the disinterested evaluative attention of the viewer. (The viewer's attention is "disinterested" in the sense that no extrinsic motive can be assigned as the source of the evaluation; I will argue that this, the traditional meaning of the term, is complexly related to what the function really is, and that it both does and does not make sense.)

First, let us discuss the expressive function. The caricaturist may choose a broad and jagged line to draw a harsh, blunt person, and then may use a thin and wavering line arranged in an unbalanced and tense composition to express anxiety about some person or event that he or she depicts. When the caricaturist portrays people, the facial expressions and the postures with which he or she endows them express their feelings as he or she wants them to be perceived; the use of the tools of line and composition as I have been describing it in the previous sentence (and, of course, of other tools that the artist can use to the same effect), expresses the feelings that the artist wishes to communicate regardless of the sitter's feelings. In addition, the artist may express himself or herself as an identifiable and unique individual by devising a personal style that both serves as a signature and carries connotative meaning; that is, some mood, or flourish, or stance. Munch's print, *The Shriek*, is a clear example of all of these aspects.

We have a great deal of testimony, and some evidence, showing that colors, shapes, and composition carry specific expressive and connotative meanings which viewers can put names to, and rate, when asked. Fitting these meanings to the subject matter is vitally important to advertisers and to the media. It would be a mad campaign indeed that would use ominous colors and composition, sombre and heavy words, and authority symbols in connection with ads designed to sustain smoking. In broader social terms, the proper use of these instruments surely affects the value systems of the culture, insofar as they can be built into the mental structures of the audience (again assuming contextual learning for mental structures). Moreover, there is some reason to believe that the more expressive an image is, the better it is remembered and, even more important, the better it is remembered relative to other structures as time passes. (Erdelyi and his colleagues have recently brought this phenomenon, which advertisers, propagandists, and artists have believed in for centuries, into the laboratory.) Research here is clearly warranted.

But what is most needed is a well-developed theory in terms of which such research could be ordered. It is not that there are no general explanations of the phenomena. There are at least three major theories about why people will rate one shape or color to be more powerful or more sorrowful than another, and there are many variations of these three. What we lack is any theory by which the expressive effect of the whole object can be related to the expressive effects of the parts. A precise theory relating cognition and feeling in a way that will be useful to these issues would be valuable to have and to test, even if it were initially simplistic but testable. There are models of impression-formation (cf. Anderson; Abelson et al.) that would seem to be applicable to this problem, and research oriented around such models might provide a good starting point for a general theory.

Because the elements of the artist's medium are themselves expressive, the artistic presentation may be expressive without representing anything definite at all. At the very least, however, if the presentation is to be part of a successful body of work, it must *identify* the artist as an individual. This particular meaning of the term "express"—as in "express one's personality"—is an essential part of the marketplace within which (at least in recent times) the artist must survive. It is therefore automatically an essential part of the culture within which all art is created, and of the aesthetics within which all art is evaluated. This aspect of creativity has become so important that expression—indeed, self-expression—is the most important, and perhaps the only, function of art to many educators, psychologists, and critics. That does not mean that expectations, schemas, and mental structures are not involved in this function of art, but that the structures are those that permit the viewer to recognize the particular artist (and the historical period) in different concrete manifestations. As little as we may yet know about the function that mental structures play in representation, we know a great deal more about it than we do about its function in expression. It is not clear what the immediate fruits of research on such abstract categories would be, and not very much has been done. The area would seem to be a part of what is usually called "social perception," and it may perhaps be a useful approach to the general cognitive problem of impression-formation and identification.

We should remember, however, that despite the great weight given self-expression today, many important works of art are devoid of "expression" in any reasonable sense of that word. The traditional subject matter of experimental aesthetics comes closest to the study of the scale on which such works rank so high.

III. Aesthetic Function: Beauty, Taste and Interest-Maintenance

Experimental aesthetics was founded in 1876 to study how we respond to the beautiful, to the tragic, to the pathetic. The response that is

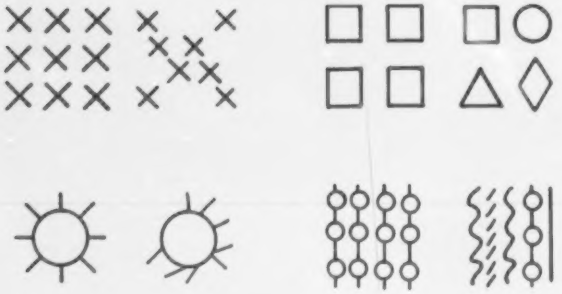

Figure 6

being studied should depend on the subject's feelings, not on his or her intellectual perceptions or judgments.

Most research has been addressed to the effects of variables like complexity and familiarity. Typically, subjects are asked to examine patterns like the pairs in *Figure 6* and to decide which are the more pleasing. In general, subjects' preferences seem to be greatest at intermediate levels of complexity. If the patterns are familiar ones, then they must be more complex in order to be maximally pleasing; if less familiar, they need to be less complex as well. Berlyne explains these results as follows: There is a cortical arousal system whose response increases linearly with the complexity and novelty of any stimulus pattern. Preference, however, first increases as arousal increases and then falls off with increasing arousal.

There is considerable support for the kind of complexity-preference findings on which that arousal model is based, but other models to fit those findings are equally plausible and powerful. For example: McClelland years ago proposed that a stimulus to which we are *habituated* is neither pleasing nor displeasing. A totally unfamiliar stimulus is unpleasant and noxious; as it becomes more familiar, it becomes increasingly pleasant; then it passes through some maximum; and when it becomes totally familiar and habituated, it becomes neutral. Small departures make for both noticeability (and therefore for "signature" as we discussed it in the last section) and unpleasantness.

There is a great deal of common observation about fashion and popular music that fits this prescription. And interestingly enough, two of the three most famous prescriptions for beauty have been held to be matters of familiar standards. Those three prescriptions are the Golden Section, Hogarth's line of beauty, and Polycleitos' Canon: the

Doriphoros. The Golden Section has long been suggested to be the region around a cultural norm, and Ruesch has recently made a very good case that Polycleitos' statue was not based on a mathematically derived principle, but an embodiment of the central tendencies of actual early anthropometric measurements. Once these were established, subsequent sculptors proceeded to make small calculated deviations from them, much as one would expect from McClelland's formulation. McClelland's model clearly has developmental and educational implications, and research to evaluate and extend those implications would surely seem desirable: any way of making a statement (whether verbal or nonverbal) more pleasing should, at least for technological purposes, be explored as thoroughly as possible.

But we should note that McClelland's is essentially a noncognitive theory of aesthetic value, as was Berlyne's and as were those of many philosophers before them. Being committed to considering the cognitive components of the perception of art and the mental structures that they imply, as far as I can follow them, I would like to reconsider what is actually going on in the gathering of aesthetic data. Let us backtrack and consider the nature of the experimental situation in aesthetic research.

Subjects do not actually describe "how much feeling is aroused" by a pattern like one of those in *Figure 6*, they actually make judgments *about* them. It is very unlikely that they would normally expend a glance on any of the patterns, if the experimenter had not asked them to do so. For this, and other reasons, all such research has been criticized more than once as being totally irrelevant to the perception of real art outside the laboratory. I agree with all of the objections, but I think that the research may well be valid anyway.

Let us go back to the definition of perception that I came to in discussing the nature of representation: *the intentional formulation and testing of sensory expectations or mental structure.* What are the subjects really doing in these experiments—giving judgments about the beauty of unbeautiful nonsense patterns? Note: The task is not a neutral one. It is not detached from an existing motive. It asks subjects to expose their taste and their sensibilities, it asks them to make themselves vulnerable with regard to a dimension of breeding and culture that has the very strongest social and class connotations (after manners and horsemanship, perhaps). It is hard to believe that subjects take this task calmly; indeed, physiological measures of arousal have actually been obtained that correlate at least roughly with the preference judgments.

In any case, there must be some motive driving the subject's comparison of any two patterns or the subject will not respond at all. In order to compare one pattern to any others, the subject must attempt to fit some mental structure to it or to identify the pattern as a departure from some design that he or she already knows. If the pattern is so simple that it is an immediate fit to some familiar mental structure, it

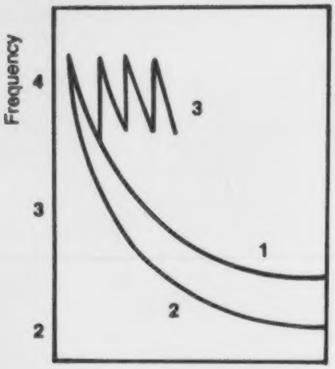

Figure 7

is banal: looking at it very soon becomes unmotivated in the sense that the viewer soon knows what he or she will see wherever he or she chooses to look. This is not metaphorical: the rate at which a viewer makes eye movements when first shown a picture is initially high—about four per second—and then drops rapidly after the first few glances (curve 1, in *Figure 7*); with a simpler picture, it drops further (curve 2, *Figure 7*); and if, as in a motion picture montage, the picture is replaced by another one before it has had a chance to become habituated and banal, looking rate is kept up at or near its original level (curve 3)—a purely cinematic device for maintaining what may be called visual momentum.

If, on the other hand, the pattern is so complex that the subject, with his or her degree of training, can find no structure that with relative economy makes the pattern "right"—that is, accounts for most or all of the parts and appears to provide a lawful basis for their relationship—it is again not pleasing. No perceptual achievement has rewarded the subject's efforts, and he or she concludes that either there is no principle to be found or the inadequacy lies in the viewer (surely not a pleasing state of affairs).

Note that this analysis makes the grasping and testing of the schema, not the complexity of the stimulus or the arousal per se, the basis of the aesthetic value, and also that a motive to undertake the evaluation task is needed—the value is not inherent in the stimuli.

This is a cognitive theory of aesthetic value, and it should have implications for the psychologist and the educator as well as for the art theorist. There is much that it leaves out, but there is also much that seems to me to be closer to the aesthetic function of art than is true of the noncognitive theories. In many lines of artistic development, sophistication brings simplification—minimal art. A great deal of education in art's premises and purposes, and in the nonverbalizable concepts that are furnished by the tradition against which the artist makes his or her "statement" and establishes his or her identity, is necessary before the audience can perceive the order in the artist's work. Without that education, or without the intention to perceive how the parts fit each other and fit the *mental structures that are provided by the tradition in which the work is being executed* (and to which it inescapably refers), there is nothing for the viewer to achieve.

From this standpoint, if the viewer does not know anything about art, he or she has nothing to like: without the required mental structure in one's visual vocabulary, and without the history in which to set a work of art, any work of art is like a text in a foreign language. Moreover, with this cognitive model of aesthetic function, having the visual vocabulary is important, but it is not enough. According to this analysis, some concern with the content of the picture (if it has any), some pride in one's expertise as a viewer—in short, some external motor—is needed for an aesthetic response. Although this conflicts with the definition of the aesthetic response with which this branch of experimental psychology was concerned—intrinsic, disinterested evaluation—I think that the analysis may still be valid: both training and some extrinsic motive (social, substantive, or other) are preconditions for the aesthetic response as it is manifested in art (as distinct from the kind of sensory pleasure to which the McClelland model may in fact apply).

New York, New York
August 1977

REFERENCES

Note: Because this paper was originally a long talk presented to a heterogeneous audience, reference to specific people and their research was quite sparse, and I do not see how to insert all of the necessary scholarship at this point. Instead, I will list the sources that will best provide the background for this paper.

The following three papers are close sources for this paper and taken together will provide most of its references:

Hochberg, J. Art and perception. In E. Carterette and M. Friedman (Eds.), *Handbook of perception* (Vol. 10). New York: Academic Press, in press.

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Hochberg, J. The representation of things and people. In E. H. Gombrich, J. Hochberg, and M. Black (Eds.), *Art, perception and reality.* Baltimore: Johns Hopkins University Press, 1970.

Gibson's theory, particularly as it applies to pictures, may be found in:

Gibson, J. J. The information available in pictures. *Leonardo,* 1971, *4,* 27-35.

Gibson, J. J. A theory of pictorial perception. *Audio-Visual Communications Review,* 1954, *1,* 3-23.

Two other sources for this approach are:

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Kennedy, J. M. *A psychology of picture perception.* San Francisco: Jossey-Bass, 1974.

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Pirenne, M. H. *Optics, painting and photography.* New York: Cambridge University Press, 1970.

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Sources on nonrepresentational functions:

Berlyne, D. E. *Studies in the new experimental aesthetics.* New York: Wiley, 1974.

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(See also the first paper in this list.)

Jeanne Bamberger

Intuitive and Formal Musical Knowing: Parables of Cognitive Dissonance

> *For it is one thing to have the number, another to be able to sense the harmonious sound . . .*
>
> Saint Augustine

Introduction

Many children before beginning any kind of schooling can clap simple rhythms, even sing familiar tunes; most can recognize tunes they "know"; and all seem able to make sense of the music that is around them in everyday life. I want to pose several questions in this paper, and maybe answer a few. The questions begin with an inquiry into the nature of that intuitive musical knowledge we see functioning in children (and adults) before the advent of any formal training. At the other end of the paper, I ask, What does an individual need to be able to do in order to comprehend fully, and to respond fully and affectively, to a significant, complex piece of music? In between, I ask, How and in what way does internalized knowledge change? What is the nature of learning and of the transitions and restructurings of internal representation which accompany it? Running alongside of these questions, I ask, What are the interactions between learning and transformation of representation in the domain of music and these same processes in other domains? And finally, how can insight into these questions inform teaching and curriculum development both in music and in other disciplines?

First, a word about "basic skills." I would like to posit the notion that basic skills and intuitive knowledge are, at best, the same—that is, both refer to the reservoir of spontaneous internal strategies that underlie and cut across knowledge specific to any one domain. They are the processes by which an individual makes sense of the world around him or her, determining the quality, value, and meaning of his or her immediate experience. By basic skills I mean, then, those internalized cognitive mechanisms that an individual uses to construct

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reality—to differentiate and aggregate, to determine "same" and "different," to select for attention, to find and build patterns and other relations. Most important, these skills also determine the nature of the interaction between an individual's immediate sensory experience and descriptions of it (both his or her own and those of others) in any of the various modes and media: gestures, words, graphics, numbers, the formal descriptions of physics or computer languages.

Such interaction must of necessity include translation, even transformation, as the individual tries to make what he or she experiences in motion and through time into a static form that is often verbal or visual-spatial. Capturing the nature of that process of transformation seems essential to our understanding of what we call learning, but it seems nearly impossible to capture the process "on the wing." It is like trying to capture the moment between what just happened and what is about to happen. Or, as a famous philosopher has said, "You can't put your foot in the same river *once*."[1] Further, we tend to believe in the results of the transformation, the external description, even when we know that it necessarily reflects only some of the features and relations of internal experience and ignores others. On the other hand, the description allows its maker to discover relations that would otherwise be impossible to see; for example, it permits us simultaneously to see and to compare events or things that are distanced in "real" time or space. Only then can we construct systematic frameworks and measures with which to build higher order relations not available to, and in fact often dissonant with, immediate experience—is the earth round?

I have called the strategies that lead to the construction of these systematic frameworks "formal"; and I have called the strategies that focus on features of immediate, situational experience, that construct meaning and coherence in another way "figural." In this paper my concern is to show evidence for both kinds of behavior or more precisely for behavior that tends towards one or the other. Most of all I will argue that the movement from figural to formal strategies is not a unidirectional process. Our capacity to maintain a persistent transaction, even coordination, between these ways of knowing and responding to the world around us may indeed account for truly musical behavior and also for new insight, learning, and invention in other domains as well.

This is where the arts come in! It is precisely because the arts lie in the intersection between intuitive experience and formal descriptions of it that I believe them to be such powerful, even essential domains of learning. Thus, research in the development of competence in the arts is in a peculiarly important position since, if it is done seriously, it can engage what is becoming a central issue in learning and development—namely, the investigation of internal or intuitive representations of knowledge and their relation to formal descriptions.

It is my hunch (borne out by the research I shall presently discuss) that music is one domain of learning that allows the incongruences that may exist between figural and formal representations to surface, while they tend to remain hidden and inaccessible to both teachers and kids when embedded in the given content of "math skills," "language arts," or indeed, in the formal descriptions of music or poetry. And if these incongruences between the basic skills of the child and the "basic skills" as they are understood and taught in the schools persist, then the child's schooling often becomes ritual, irrelevant, or the child is said to "fail to learn."

If you follow this argument, justification for the arts in the schools seems easy. This form of justification, however, only falls out if we simultaneously pursue our work in a number of related domains and in an interactive way. What follows in this paper is an attempt to do just that.[2]

I

After these rather too long introductory remarks, I would like to tell a set of stories—the first in a series of parables of cognitive dissonance. The stories represent the attempts of three not quite hypothetical individuals to translate their experience of a piece of music into a verbal description of it.[3] *Figure 1* reprints the score as it is usually printed. *Figure 2* shows just what Storyteller 1 says he heard. Each story will, I hope, encourage you to hear the piece differently as its teller shifts your focus to differing features and relations of the piece—to those aspects of the piece that, at least in translation, capture his experience of it. The stories should also serve to illuminate the relation between the musically rather bare experimental situations that form the centerpiece of the paper and those situations that are more like what one thinks of as musical. The experimental situations are primitive in two senses: they engage their participants in primitive musical exercises, and, I believe, they also begin to reveal those "cognitive primitives" from which more far-ranging musical behavior derives. After a brief look at the stories, I will revisit them once more at the end of the discussion.

> Story 1: *Student in an introductory music class*
>
> There is a first part where you hear the same tune pretty much all the time and there seems to be an argument going on. Then another tune starts that sounds different, sadder, and the argument seems to get resolved, here, but not happily. That's the second part. And then, the first part comes back again only it's longer—I'm not sure what happens there. Then the second tune comes back again followed once more by the first part. So I guess you could say there are three parts—the second part is really different, and the first and third parts are alike. (See Figure 2).[4]
>
> Story 2: *Music major in a first-year musical analysis class*
>
> That story is all wrong; he has the wrong parts because he's too

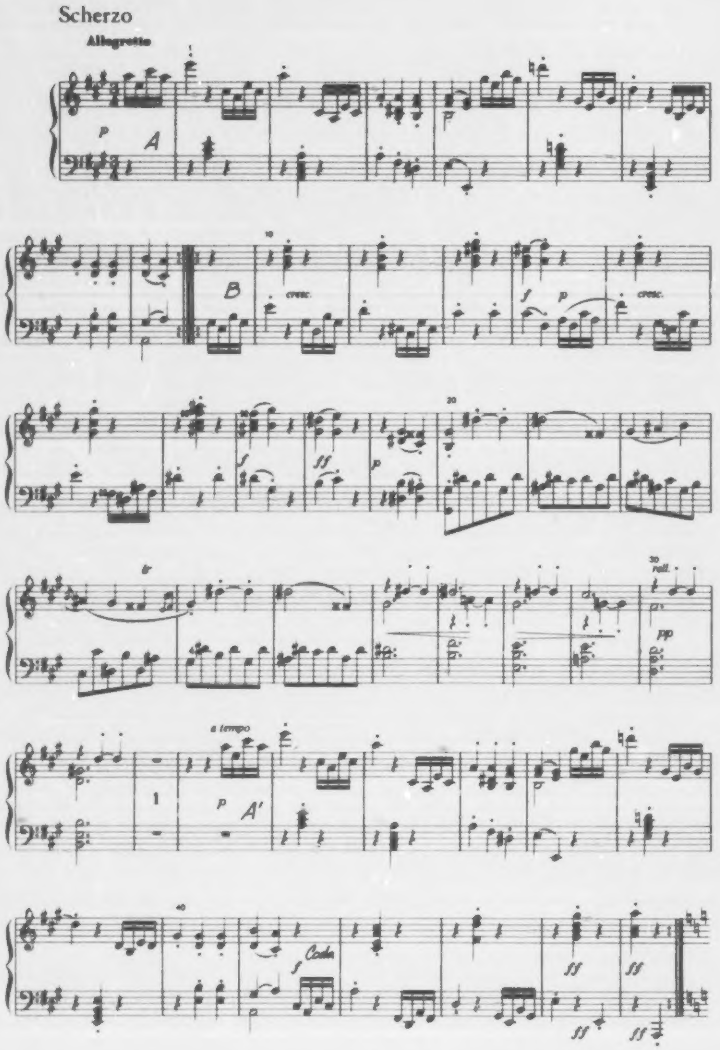

Scherzo
Allegretto
p
A
10
B
cresc.
f
p
cresc.
f
ff
p
20
tr
30
rall.
pp
a tempo
1
p
A'
40
Coda
f
ff
ff
ff
ff

Figure 1 *Scherzo*

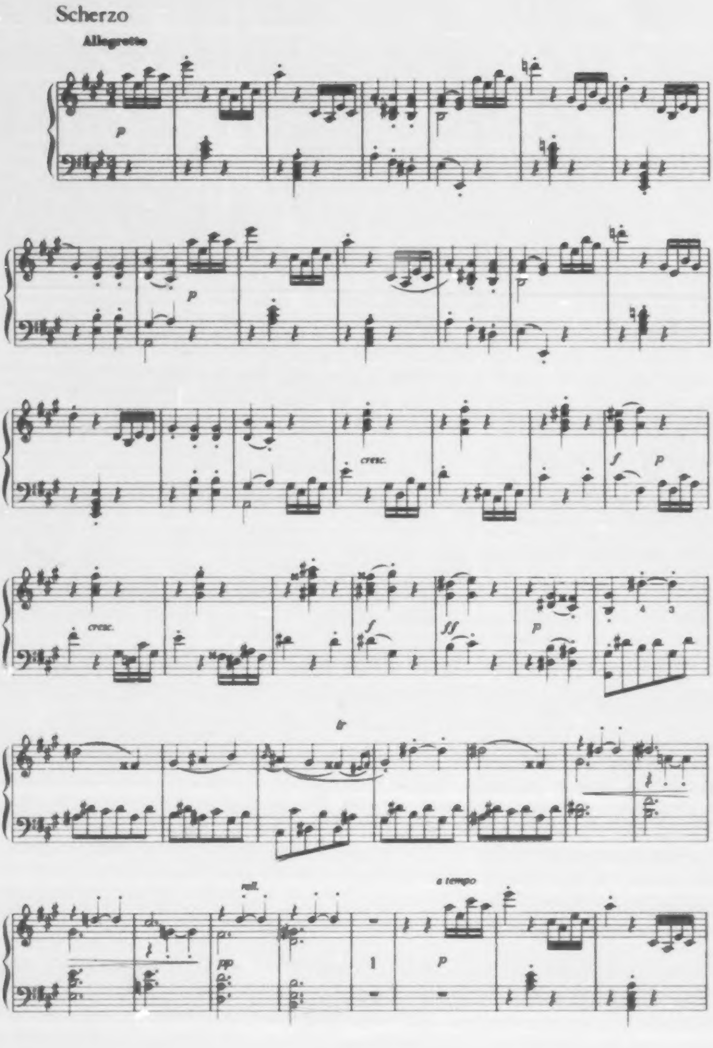
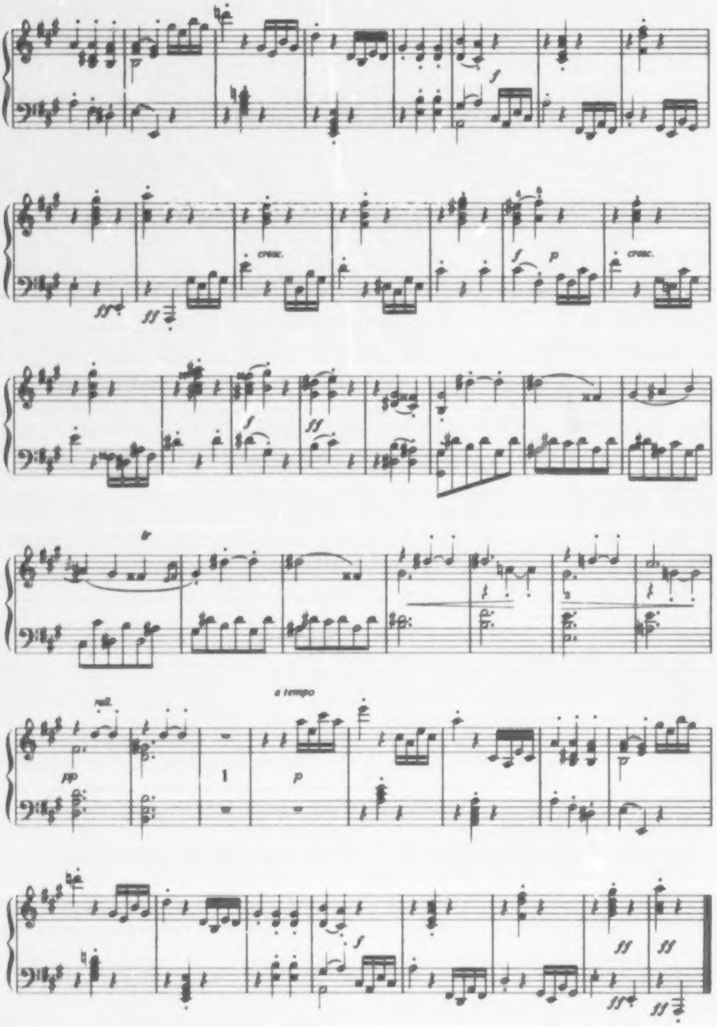

Scherzo
Allegretto
p
cresc.
f
p
ff
rall.
pp
a tempo
tr
1

Figure 2 Score for Story 1



p
f
ff
cresc.
p
cresc.
f
ff
tr
rall.
pp
a tempo
1
p
ff

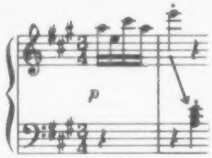
(Figure 2)

busy telling a story and listening to tunes and not paying attention to harmony and to form. The piece is a minuet or scherzo. It is in 3/4 time and has the form //: A ://: B + A' :// . The first part, A, is repeated. It has 2, 4-bar phrases and stays in the tonic key. The second part doesn't begin with the so-called new tune, it begins before that with the change in key. The new tune is part of the middle or B section which is a development of A. It modulates several times. The third part, A^1, returns to the original key and to the original material and includes a short coda. The second and third parts are repeated. So it is, like I said, a typical minuet form.

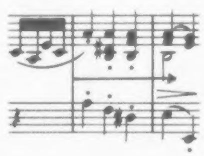
Story 3: *Performing Musician (long-winded)*

Well, that story is okay, but it's boring and it misses the point. In fact, it stops where I would begin. What's really great about the piece is that the whole thing grows out of the opening germinal figure through a series of transformations on it. The boundaries of sections that Storyteller 2 mentions actually mark off larger figures. These relations are all generated by particular transformations. Each of the transformations thus depends for its meaning on the particular changes of the germinal figure and on the situations where they occur in the sequence of events—on what comes before and after them.

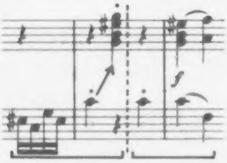
Germinal Figure:



For instance, the germinal figure (after several varied repetitions) is transformed in the first part (called A) by extension to form a figure twice its initial time:

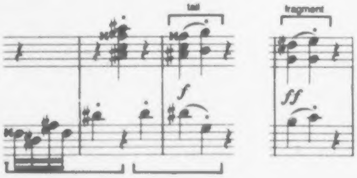


This transformation creates a "boundary figure"—the one that, in this piece, marks important landmarks along the path of the larger structure. In the second part (B), the total time of that boundary figure and the note-note time values are still exactly the same, but the figure is regrouped into *two* sub-groups. As a result it sounds quite different in character. (I guess Storyteller 1 doesn't agree with me about that—he heard it as pretty much the same.)

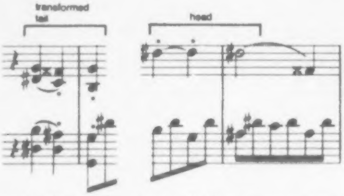


This transformation brings the high/low contrast of the germinal motive to the surface, marks it for attention as a *particular* feature. Thus, I would say that we learn about the germinal figure through the multiple forms it takes.

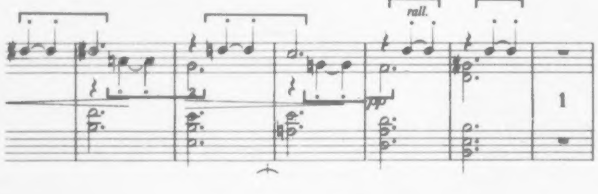
The next transformation is probably the most significant one thus far. The boundary figure comes apart; it is fragmented so that only its tail is left:



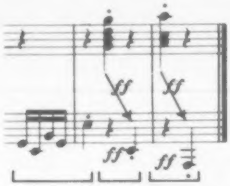
This tail then becomes a head, its *function* is transformed. And this generative transformation gives birth to what Storyteller 1 called the sad tune (I like that, by the way). Actually this new tune can now be understood as an outgrowth of the transformational process.



Even the effect of resolution of the argument in Story 1 is the result of transformation—the *juxtaposition* of high register becomes one of *superimposition* in the form of melody with accompaniment. The transition back (or forward) to the original form of the germinal figure is realized through more fragmentation, finally dissolving into silence:



> The piece closes with a final transformation of the boundary figure—now the boundary of the whole piece—the coda with its catchy punch. Here, the measured values of the figure still remain the same but the contrasts in register, which keep gaining new significance, are intensified so that the "same" again sounds quite new. A shift in accent structure (to form groups of *twos)* seems to make the whole piece speed up to a running finish, thereby the catchy punch-line ending.



> So, while I agree with Storyteller 2 about the finished product—it is, I suppose, a minuet or scherzo—I don't think that captures the unique process of this piece or what you might call the immediate experience of the piece in all its particularity. His story would be the same for lots of other pieces; he's hearing it as an instance of a class of pieces. I suppose I make use of his classifications, too, but my experience as a listener, and what I need to have as a performer, isn't captured by simply subsuming the unique process of this piece under a type of schema which equates it with any instance of it. I'm reminded of a comment of Polya's in *How to Solve It* (1957): "This principle is so perfectly general that no particular application of it is possible."

The kinds of dissonance among the stories differ: some of the differences the storytellers themselves pointed to. Rather than elaborating on them, I will leave them as parables of cognitive dissonance. I hope the nature of the cognitive dissonance that underlies the three stories will be explicated by the more pure instances in the experimental situations.

II

The second set of parables are true ones, but they are not actually stories. They are drawings that, I think, tell a story. The drawings were made by children as they tried to translate their experience of a simple rhythm into a picture of that experience.

The drawings in *Figure 3* are all pictures of the *same* rhythm. I have selected them from some 200 made by children between the ages of seven and twelve to illustrate a typology. The rhythmic figure is one of six which I asked children to listen to, to clap back, and then to draw. Once I was sure that the children "knew" the figure—i.e., could clap it back correctly—I asked them, "Draw a picture of your claps so you can remember them next week or so someone else could play them." Because the children were encouraged to draw anything they liked so long as their drawings could function as a reminder of the particular figure they heard and played, the drawings can be thought of as the various ways the children found to fix and project their "active knowing," their "knowing-in-action."

The drawings clearly tell different stories. How can we account for their differences?

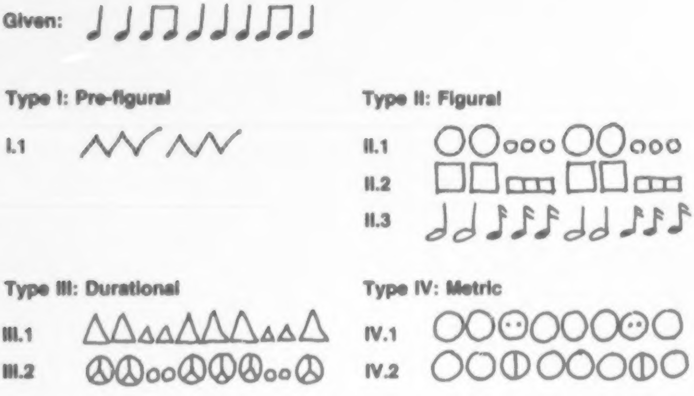
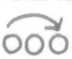


Figure 3

The drawings are most immediately distinguished from one another by, and have been grouped with respect to, just which events (claps) are drawn alike, that is, given the same size and/or shape. For example: Type II, figural drawings, show clap 5 to be "the same" as claps 3 and 4; Type III, durational drawings, show clap 5 to be "the same" as claps 1 and 2 but different from claps 3 and 4. I have taken these varying expressions of similarity relations as clues to the children's internal strategies of representation—how they represent the figure to themselves. I ask, In what respect *could* claps 3, 4, and 5 be alike? In what respect *could* claps 1, 2, and 5 be alike? I take the answers to these questions as strong evidence for the features and relations of the figure that the children spontaneously chose as salient as they grouped events together and distinguished them from one another.

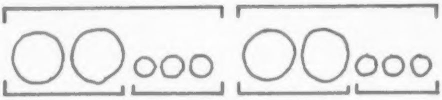
What *possible* features and relations of the clapped figure could give rise to just these similarities and differences? In Type III drawings for instance, it is clear that, as in standard notation, claps are drawn the same with respect to time; that is, with respect to the time from one clap to the next (what musicians, perhaps confusingly, call *duration* but what is better termed "attack time.")[5] Claps of longer duration are consistently drawn with bigger shapes, claps of shorter duration are consistently drawn with smaller shapes. These children are *measuring* the duration of events in relation to one another. There are two kinds of events, long and short; each event is classified as one or the other regardless of where it occurs in the course of the figure. But from this view Type II drawings then appear "wrong." Clap 5, for example, is "short," when it should be "long." One child, trying to play the figure from Example II.1, said, "The fifth clap is wrong because you have to wait longer there; it's hard to play it with a short clap there." For him, the smaller shapes stood for shorter durations—thus the *drawing* was simply wrong, not his particular way of understanding or decoding it.

But what features of the figure could account for the Type II child's expression of similarity? In what way could claps 3, 4, and 5 be "the same"? To find an answer, we must change focus to the actual experience of clapping the figure. Paying attention to the sense of movement and gesture, to what I will call its "felt path," changes our view of the figure. Attending to this felt path, the three claps drawn with small shapes become a single gesture, a small bounded figure. Indeed, in Example II.2, the child has actually drawn these events bound together. The child who drew Example II.1 put it this way: "There are two claps and then three. The three little circles go together and they get faster." She gestured with her arm to show that "go together" meant bound together in one gesture,  and she explicitly pointed to two groupings—two and then three. Notice that she uses a kind of action language: "go together," "*get* faster," "and then," in contrast to more static language like "*is* faster." When challenged by her Type III peers, "But that clap (clap 5) is longer; it's the same as the first two," she said, "No, there's a gap there, a space. It doesn't matter how long that one is; you just stop and start again."

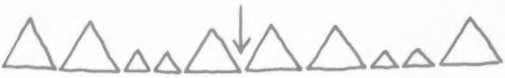
The child's story focuses on her actions—what she does—as if she were moving along a unidirectional path towards goals or landmarks formed by her changes in pace. The drawing can be seen as the child's rather remarkable attempt to translate this active, bodily, internal experience into an external, static, visual image of it. She translated her experience of movement into a sequence of shapes representing claps. The changes in the size of these shapes capture the changes of pace and also show how the actions cluster together as a *result* of this change in pace. Remaining close to her felt path, she did not distance herself from it to *measure* the time of events in relation to one another or in relation to some superordinate fixed measure of time.[8] While she must reflect on her actions simply in order to make the translations, her reflections on the description itself do not reveal what others may see as logical inconsistencies. Her focus remains close to her own experience; it constructs a different "logic."

Attending to the claps as marking actions along her felt path, she described claps 3, 4, and 5 as a series of "faster" actions that are "the same" because they "go together" in a single bounded gesture or figure. While her Type III peers describe clap 5 as "the same" as claps 1 and 2, our figural child describes clap 5 as different, pointing to the "gap" as the distinguishing feature. Indeed, considered from the more distanced view of *measuring*, the fifth clap together with the "gap" forms a single event of longer duration. This "package" of sound and silence (clap and gap) is equal in duration to events 1 and 2. But in light of their respective *situations* and *figural functions*, the "packages" become quite different sorts of things: Claps 1 and 2 start off the figure, establishing a normative pace. Claps 3 and 4 introduce a change of pace, and Clap 5 is heard as the last member of this faster group. Within this context of faster actions, the silence which follows Clap 5 becomes a salient feature while it was *not* a salient feature in the context of the slower actions—that is, Claps 1 and 2. It is the "space" that separates the faster figure from the "start again" that follows. As a *function* in this particular situation, the gap is not measured nor does it show up in the drawing—how do you make a picture of "in between"?

What *does* show is the way action-events, as gestures, cumulatively aggregate to form figures; indeed, the figural or motivic structure of the rhythm and the situational functions of events come sharply to the surface in Type II drawings. There are two large figures, the second a repetition of the first, and within each larger figure there are two inner figures:



Comparing this with Type III drawings, we see that the latter translation captures the relative duration of events but, in doing so, graphically obscures the figural grouping:

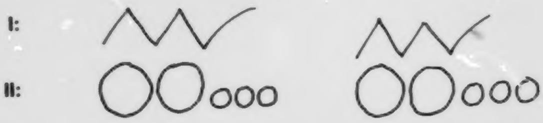


The two kinds of drawings can be seen as different kinds of maps of the same "trip," with each traveler attending to different features along the way. Type II drawings map the *passage* and the rate of passage from one boundary landmark to the next. Events remain contained within their boundaries. Events that are distanced in time and that belong to different figures are not compared, nor are events that are measured across the landmarks that form the boundaries of these figures. Type III drawings map the measured similarities among events, even those events that are distanced in time/space and contained in different figures. It is this attention to *measure* in contrast to *situation* and *func-*

tion that most particularly distinguishes figural from durational drawings and implicitly distinguishes the different underlying strategies of representation.

What about Type I and Type IV? They are best understood as more extreme versions bracketing the two middle types. As such, they help to make the distinctions between Types II and III more clear. Type I was found only among the youngest children (ages six to seven) and appears to be at least a forerunner of Type II, if not a precondition for it. Type IV was found only among the oldest children (ages eleven to twelve) and clearly reflects a developmental advance over Type III.

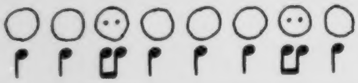
Let me give some examples: Type I drawings, like Type II drawings, show the passage from one boundary to the next, the actions along this path, and the repeated clustering of these actions to form figures; but Type I drawings are literally action-drawings: they were actually "played" on the paper. The trace left by this "performance" shows the two larger figures (one a repetition of the other), and the "gap" between (the child *actually* picked up his pencil). But, while the children did change pace within the figures as they drew, the change of pace does not show in the trace left by their playing-drawing. Thus, we see the correct number of events within the two larger figures but no distinction between or relations among events except succession—next, next, next:



Type II drawings differ from Type I drawings, then, because they are the result both of the children's *reflections* on their actions and of a significant translation of them; they are "thought actions" rather than a tracing of the actions themselves. In this sense, Type II drawings show a progression towards symbolic description: the picture *stands for* the child's actions rather than *being* the actions. In addition, and perhaps as a result, Type II drawings are more *complete;* they show a greater differentiation among events and a further articulation of the grouping structure. And in terms of the task ("Draw a picture of your claps so you can remember them next week or so someone else could play them"), Type II drawings are more *adequate* because they include more information for later use. Altogether, then, Type II drawings show natural cognitive growth, most particularly growth in the ability to translate immediate sensory experience into a description of it. I have called both types *figural* because they share a focus on actions along the felt path of the figure, they capture the figures formed by the flow of events and their boundaries, and because the meaning of these events is primarily the result of their particular situation within these figures.

Between Type II and Type III drawings there is a cognitive leap rather than a simple developmental progression; that is, there is a significant shift in feature focus away from figural situation and function to measuring, a shift which implies a significantly different underlying strategy of representation. The focus on measuring that characterizes Type III strategies is further developed in Type IV drawings; that is, while Type III drawings show the *relative* duration of one event as compared with the next, Type IV drawings show the *exact duration* of each event with reference to an unchanging metric grid. This "fixed reference" functions as a general scheme in relation to which all events, regardless of position in the sequence of events and regardless of figural function, may be viewed. These latter characteristics are the distinguishing attributes of a *formal* strategy of representation.[7]

In Type IV drawings, the metric grid or background beat is always drawn as ○ while actually played events are shown against it ⊙. For example: when the performed event is equal in duration to the underlying beat, only the beat is shown ○; when the performed events are some division of the underlying beat, the beat is shown as background, and the division by the appropriate number of dots inside the circle ⊙. Thus claps 3 and 4 go twice as fast as the metric unit, dividing it into two, while the fifth clap again coincides with the unit beat:



It is most interesting that in making their drawings these children must remove themselves from immediate experience in order to extract from what they actually play and hear—their felt path—this underlying unit-time that is not itself performed. Further, they must coordinate beat with piece and map the varied durations they play onto the fixed reference, the metric grid. While the beat is indeed generated by these varied durations, the ability to extract it, to hold it constant in the face of changing situations and functions is evidence of further cognitive developmental growth. If Type II drawers have made "thought actions" in their drawings, Type IV drawers have constructed a "thought *schema*" that they have coordinated with these "thought actions."

In the process of making their drawings, these children have come close to inventing standard rhythm notation (SRN). They have invented a systematic way for accurately measuring and classifying events that they can apply *generally* to *any* rhythmic figure. But Type

IV drawings have an advantage over SRN: the reader can always *see* the underlying beat as well as the performed events and the relation between the two. In SRN, the relation is hidden in the symbols themselves.

Both Type III and Type IV drawings are called *metric* because they share a focus on *measuring*; at the same time, both ignore, even hide, figural and situational functions in favor of *classifying* events with respect to their duration—that is, an event of the same duration is described as the same regardless of its position in the sequence of events and regardless of its functional meaning.

I would now like to suggest that the distinction between figural and metric (or formal) strategies reflected in these drawings of rudimentary rhythms is also relevant in the broader context of the performance and understanding of actual musical compositions, and that both strategies are necessary for fully developed musical competence. Indeed, it is this distinction in strategies that we saw reflected in the three stories of the Beethoven sonata movement.[8]

In the more traditional language of performing musicians, figural strategies of representation have to do with "phrasing," the "shaping of a phrase." The performer reflects and projects figural relations and figural grouping in his or her decisions concerning bowing, breathing, fingering, dynamics, and the subtle give-and-take of the measured beat. The figural grouping the performer constructs is most often not given in the score. The performer derives it by paying attention to particular features and relations in the sequence of proximate events as these occur in the flow of the piece. Within any one piece, figural functions and the figural grouping of an event can change, transform, and regroup in response to particular proximities and particular changes among relations in other aspects of the piece. For example, events that are equal in measured time can take on quite different effect and function in the context of a given passage. Storyteller 3 pointed to instances of just such transformations in describing the "boundary figure" that was always the same in total time and in note-note values but changed its character as the result of the contrasts in register and subsequent regrouping.

Metric groups, the grouping of events with respect to the underlying metric grid, correspond to the beats and measures indicated in SRN. In contrast to figural grouping, metric grouping remains largely invariant throughout a piece, at least in the music with which we are most familiar. Thus, the metric function of an event will always be the same or will be different from another event with respect to its place on the metric grid, *not* in relation to its particular context. In this sense, the metric grid provides a single scheme for defining the metric function of any event in a given piece, regardless of its position or contextual function in a particular figure and regardless of its particular proximities with other events. Storyteller 2 was more attentive to these kinds of context-free formal schemes. For example, not only did he view the whole piece as an instance of a formal scheme called "minuet" or "scherzo," but he talked in terms of 3/4 meter, phrases of equal length, and so forth. While Storyteller 3 took these general categories into consideration, indeed had to in order to go on, he also attended to the unique particularities of events resulting from their relations as embedded in the immediate context of the figures of which they were part and which they helped to generate. As a result, he was responsive to what he called the "greatness" of the piece, its organic evolution through a series of transformations on its germinal, opening figure.

I would like to argue that it is precisely this coordination of figural and formal relations that distinguishes both what we call a "musical" performance and a fully comprehending, deeply felt response to a piece of music. The distinction I have described relates both to general issues of cognitive development and also to practical issues like performance and even learning to read SRN. Notice that Type IV drawings and SRN require individuals to distance themselves from immediate experience so as to extract the unchanging unit-time, the beat, from the played durations of the figure holding the beat constant in spite of the seductive pull of figural groupings and situational functions. Drawing a Type IV picture requires coordination of this "fixed reference" grid with the changing durations and their functions within the figure, mapping one onto the other. Described in these terms, metric strategies help in understanding the difficulties young children (and even adults) have in learning to read SRN. Indeed, the difficulties are closely related to aspects of natural cognitive growth in other domains. The ability to differentiate properties and then to recognize invariance of one (the beat) in the face of the changing context and the "route traveled" of the other is exactly the kind of capacity that Piaget characterizes as exhibiting natural cognitive development.

Conservation can be described in much the same terms. In the classical water conservation experiments, for example, children are said to conserve when they can distance themselves from immediate experience so as to differentiate the particular properties of the situation (water and shape of glass) and then to coordinate them so as to recognize the invariance of one (water) in the face of the changing context of the other (different shape of glass).

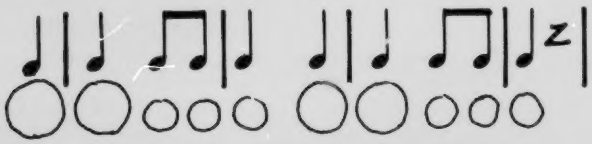
In the light of these general cognitive issues, it is not surprising that young children in the face of changing proximities and functions within figures have difficulty consistently differentiating beat from figure and that they also have difficulty holding the beat constant in thought.

My observations of beginning readers give further evidence for this speculation. The behavior that I and others have seen specifically suggests that a figural encoder (drawer) trying to decode SRN is faced with a description that does not match his or her own way of translating experience. For example, a beginning reader seeing the notation

♩ ♩ ♫ ♩ will play something like ♩ ♩ z ♫ z ♩ . That is, she or he will stop before the two ♫ 's, clap these notes faster, pause again, and then clap the last note. The mistake can be understood as a mismatch between figural and formal descriptions—in fact, between Type II and Type IV drawings.

The child's performance suggests that he or she interprets the graphic boundaries of *metric units* (beams—the crossline joining the two eighth notes—and bar lines) as if they stood for the graphic boundaries of *figures*. Thus, ♫ is read as "getting faster" and also as "going together." So, to make the graphic groups "go together" in a bounded gesture, the child leaves a "space," a "gap," on either side of the supposed little figure. Seeing what looks like a figural group, the child simply makes one. He or she treats the metric symbols as if they were graphics or pictures like Type II drawings.

In fact, SRN (like Type III and Type IV) hides or graphically interrupts the figural grouping. The measured units shown by beams and bars visually break up the figural groups. Looking at the two descriptions together makes the mismatch quite clear:



Just as a Type II drawing is seen as "wrong" by Type III drawers, so Type II drawers see SRN as "wrong." They cannot match their figural representation with what they see depicted on paper.[9]

While we found that the older children could be helped to confront these mismatches in description and could then learn to coordinate figural and formal descriptions, this was not helpful for the younger children. Indeed, we found that it is wiser not to present the formalisms of SRN until children have developed the necessary underlying cognitive skills. Of course, younger children can certainly be taught to read given patterns in SRN, but they will most likely be limited to a kind of picture vocabulary that they have learned by rote. Such rote learning may discourage children from making full use of the *principle* of SRN later on—from extending it, on their own, to patterns that they have "not yet had." But more important, an early emphasis on SRN may discourage and confuse children, inhibiting the development of their natural figural "knowledge."[10]

These stories of cognitive dissonance carry with them another message: the urge to maintain a particular view as *the* view is pervasive and powerful. It protects all of us from the threat of upsetting the very means by which we make sense of some small part of the world around us. Yet learning to shift focus, to restructure our current "windows to the world," and thus to appreciate another's view may be the most crucial aspect of any significant learning experience. But it always involves risk: the risk of temporary cognitive disequilibrium. If we are going to help children to learn creatively, I suggest that both teachers and students be encouraged to take such "cognitive risks"—to make many different descriptions of the "same" thing, to recognize that each new focus captures different features, and to understand that this is not a matter of right or wrong. Both teachers and students may in this way discover new ideas and may even come to a better understanding of themselves and one another.

III

The third and final parable of cognitive dissonance is the story of one child with whom I worked over a period of six months. While the previous stories have focused on cognitive dissonance among groups of individuals, this one focuses on the cognitive dissonance one child eventually risked confronting and on the "cognitive work" he did in learning to coordinate initially dissonant descriptions of simple tunes. Many of the same distinctions that emerged from the children's drawings appear again in this experiment, but I believe the distinctions emerge with greater clarity because of the greater richness of the task.

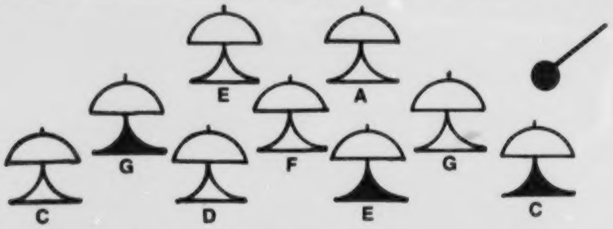
This experiment also differs from the others in that instead of excluding interventions on my part, I *used* them as an important aspect of the experimental situation. I argued that I might intervene in the situation in a planned way as in other scientific experiments in order to test an hypothesis concerning the child's strategies, particularly during periods of transition. At the same time, I might gain useful information for later applications in teaching and curriculum development.[11]

In this experiment, I posited the notion that the child, like the adult scientist or artist, gains new insight only over long periods. He or she tests, risks cognitive disequilibrium at times, and struggles with the incongruences that inevitably arise: "The sudden insight in which a problem is solved, when it is solved suddenly, may represent only a minor nodal point, like the crest of a wave, in a long and very slow process . . . the development of a (new) point of view." That is Howard Gruber (1974, p. 5) talking about Darwin, but it could apply just as well to Jeffrey, the small boy in this experiment.

Jeffrey was one of four children who came into the Children's Learning Lab at MIT as members of an experimental teaching project. Jeff, like the others, was chosen by lot from a third-and-fourth-grade class at the Cambridge Alternative Public School. Three of the children, including Jeff, were black. The children came to the Lab twice a week for about an hour and a half.

It was evident from the beginning of their six-month stay in the Lab that Jeff, who was eight years old, was well behind the others in school skills. He talked little (reportedly "not at all" when he entered school at six), he could barely read, and his math skills were limited to counting, although even here he sometimes failed to make simple one-one correspondences. Jeff, however, was an adept tune-builder right from the start.

The materials for the tasks are a set of tuned bells borrowed from the Montessori teaching materials but used here in a rather different way. The player is given an array of bells, all of which look the same except that a few have brown bases while the rest have white:



The white bells include the pitches C, D, E, F, G, A; the brown bells include matching C, G, E bells. The bells are not marked so the only way to distinguish them is by playing and listening to each one—i.e., by ear. The player knows (from previous matching games) that a brown and a white bell may match (sound the same pitch) but that no two white bells will match. The player is asked to "Build a tune with the bells." In this example the tune was "Twinkle, Twinkle, Little Star." Once the tune is built, the player is told to "Put some instructions on paper so someone else can play the tune on the bells."

Over a period of six months, Jeff's performance of this task took three different forms, each marking a new phase in his work. I have identified the three phases of Jeff's work in terms of the changes that occurred in four characteristics of the task: the strategy of construction (how he actually builds the tune with the bells); the resulting arrangement of the bells on the table; his performance strategy (how you "go" on the bells to play the tune); and the instructions he draws "so someone else can play the tune." All of these together provide clues from which I derived the characteristics of Jeff's internal strategies of representation. Not surprisingly, I have named the three phases figural, transitional, and formal.[12]

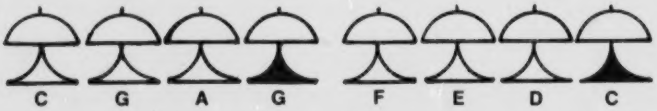
Jeff was an adept figural tune-builder from the outset. He worked in a consistent, focused, and persistent way, with what seemed a clear sense of goal. His initial construction strategy was as follows:

1. Find the first bell by playing through the mixed array.
2. Remove the found bell from the array and place it in front of the others on the table.
3. Play the found bell and test for the next bell in the tune. For each test, play the found bell and then the test bell as if each were already in the tune (e.g., play the found bell twice [Twin-kle] and a test bell twice [Twin-kle]).

4. When a test bell is found that matches the next event in the tune, remove it from the array and place it next to the already found bell—1, 1-2.

5. Continue this process, each time starting from the beginning of the cumulating path of bells when testing for the next one in the tune. When each pitch event in the tune has a matching bell in the row on the table, the task is completed.

The result of this construction strategy was a *bell path* that includes one bell for each pitch event arranged in order of their occurrence in the tune:



Jeff's performance strategy, his *action path*, was simply to "go straight ahead" along the bell path. Thus, the bells become stepping stones along the unidirectional action path; they mark the route through the tune much as claps mark the route through a rhythmic figure. I call his strategy of construction a *felt path* strategy by analogy with the felt path of a clapped rhythm and also with the familiar experience of marking the chronological occurrence of chosen landmarks as one walks through time along a path from here to there: next, next, next. The temporally experienced landmarks become a description of the path—the way one remembers it. Kevin Lynch in *The Image of the City* (1960, p. 83) describes this way of finding paths through a city:

> (Landmarks) are frequently used clues of identity and even structure, and seem to be increasingly relied upon as a journey becomes more and more familiar . . . . A sequential series of landmarks, *in which one detail calls up anticipation of the next and key details trigger specific moves of the observer*, appeared to be a standard way in which these people traveled through the city. In such sequences, there were trigger cues whenever turning decisions must be made and reassuring cues that confirmed the observer in decisions gone by . . . . The sequence facilitates recognition and memorization. Familiar observers can store up a vast quantity of point images in familiar sequences, *although recognition may break down when the sequence is reversed or scrambled*. (Italics mine.)

Like the traveler moving through the city, Jeff constructed his felt path by building up "a sequential series of landmarks, in which one detail calls up anticipation of the next." Jeff *like the traveler seemed to put himself on the path of the tune* in order to search for each new (next) bell. For each test, he started over from the beginning of his cumulating bell path and played up to the point of the next event, bodily performing on the already placed bells and on each trial bell as if it were already in the tune. Thus each bell along the path served as a landmark that "calls up anticipation of the next"; each bell along the path, like each clap in the rhythm for the Type II drawer, served a function and marked a place on Jeff's repeated trips through the tune.

Notice that once a landmark (a bell) is passed over in space or past in time, it is gone until the trip is made again. Like the traveler in the city, Jeff's path was unidirectional—"recognition may break down when the sequence is reversed or scrambled." And like the sequence of events in a clapped rhythm, the meaning of the objects in space and the events in time are determined by their particular *situation* along the route. Just as it is not relevant to nor even recognized by the Type II drawer that events distanced in the rhythm are the same in *duration*, so it is not relevant to nor even recognized by the figural tune builder, that some bells distanced in the tune are the same in *pitch* (two G bells, two C bells). It is their *situational properties* rather than their "fixed properties" that define them.

For example, although "the second one" along the path (G) and "the resting one" that marks the ending of the first small phrase (G) are the same in pitch property, they are not the same in position or function, that is, in their situational properties. Just so, "the first one" (C) and "the last one" (C) are not recognized by Jeff as the same although, as we shall see, their function of marking the outer boundaries of the tune makes them more similar situationally than the two G's.

Jeff's instructions for playing the tune were consistent with his construction strategy. Since the bell path is itself a description of the sequence of events in the tune, a copy of the bells on the table is almost sufficient. In this respect, Jeff's picture can be compared with Type I drawings; a literal tracing of the bells on the paper is like a literal tracing of actions:

Hits:	2	2	2	1	2	2	2	1
	|	|	|	|	|	|	|	|
Bells:	1	2	3	4	5	6	7	8

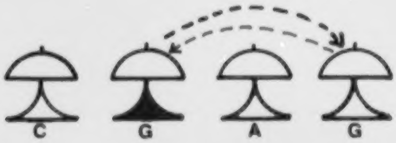
The numbers were added when I asked Jeff, "Can you put in some numbers so the player could tell just how to go?" Jeff added the lower numbers to show the unidirectional sequence of tune-bell events saying, "You just go straight ahead." The upper numbers were added to show "How many times you hit each bell." *But notice that Jeff can name the bells only after they are already embedded in the tune sequence.* That is, the names (numbers) are entirely dependent on the particular sequential ordering of the bells in *this* tune; they tell us nothing about their relations to an "outside fixed reference" nor about how they might relate to one another with respect to other tunes.

Notice, too, that Jeff used numbers in two ways: when naming the bells, he "counts on" them as on a number line; but in showing the hits, Jeff "counts up"—he shows the aggregate of hits. There were several instances where Jeff confused these uses of number (as we shall see), and interestingly, the confusions always went together with a shift in focus from pitch-events in the tune (the bells) to actions on the bells (the hits). This confusion stems in part from the fact that Jeff *did* use the same bell twice when the same pitch was immediately repeated in the tune. It seems that when a pitch is immediately repeated it is, so-to-speak, "more of the same" in both pitch and function, and Jeff did in fact recognize it as such. But, while the pitch "stands still" under those circumstances, the hits go "onward" in time. Coordinating these two dimensions—pitch and time—was a major part of the cognitive work that Jeff was yet to do, it required among other things, a leap into symbolic description.

I call this initial strategy 'figural" because like the strategies of figural rhythm drawers the choice of significant features, the grouping of elements, and the meaning of elements including "same" and "different," depend on their present function within the particular figure in which they are found. The figural builder works cumulatively and unidirectionally in felt path fashion (next, next, next) and, like the figural rhythm drawers, never turns back to compare a present event with a distanced past event. A figural builder insists on having one bell for each pitch event in the tune because he or she does not separate pitch properties from situational properties. The "same" pitch in a different situation is heard and described as different. There is, then, no conservation of pitch over time or contextual embedding. Bell path, action path, and sequence of events in a tune are all merged in a single, congruent representational space.

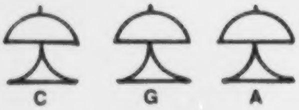
The transition to the second phase of Jeff's tune building took place over several weeks. It is in these transitions that characteristics of both figural and formal strategies emerge more sharply.

One day, for example, after Jeff had built the tune, I asked, "Can you find bells that match?" Focusing on this as a separate task, Jeff had no difficulty finding the matching G and C bells, although he was visibly surprised to discover that there were matches in the tune. I suggested, then, that since two of the bells were the same (the two G bells), he could play the tune using just one of them. He looked rather puzzled, thought for a moment, and then, remarkably, switched the two G-bells:

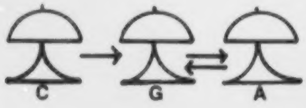


Clearly, one bell could substitute for the other, but both were necessary as place markers along Jeff's action path. Because the bells were recognized as identical in pitch property, they could be interchanged; but when embedded in the tune, they assumed their figural function as landmarks along the felt path. Pitch property could not be separated from the object "bell" except as a separate experiment.

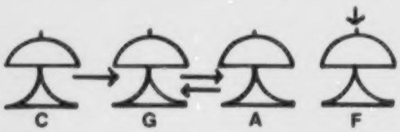
Jeff's transitional behavior became more evident some days later when I asked him if he could build the tune with only the white bells. He had tried this earlier, but when the remaining mixed array of bells had not produced the sound he needed, he had always said, "I need another bell." This time, after finding the first three bells of Twink,



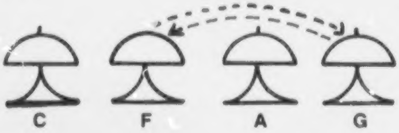
he searched in the remaining array for the next. Not finding it, he began again from the beginning and this time searched among the bells already in his bell path for the next one in the tune. This was a new tactic for Jeff! It implied that a past bell could be used again and that the same bell could be used for more than one tune event. Finding the bell he needed, he smiled and said, "I had it already." Then, testing his discovery, Jeff started once more from the beginning of his path, played the three bells in a row, and then almost reluctantly continued the tune by *turning back his action path* to strike the second bell again:



This action was a big switch in his familiar strategies and one that did not remain stable in this transitional phase, as is clear from what happened next. The next step incorporated the new strategy. Continuing with his building, Jeff started over from the beginning, placing himself once more on the bell path. He played the first four events including the "turn back," searched for the next bell in the remaining array, found it, and added it to his cumulating bell path:

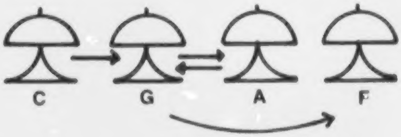


But now the flux of transition showed up. Checking, he started from the beginning again, but this time the pull of the familiar unidirectional action path was too seductive. Forgetting the "bend" after the third event, Jeff went straight ahead! He played the four bells in the familiar way—a chronological sequence of events—next, next, next. The result was a new tune and Jeff was clearly bewildered.[13] Retreating now to a previous "fix-up," Jeff tried switching the second and fourth bells:

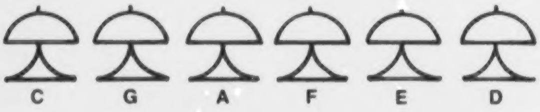


It had worked before with his previous construction when the second and fourth bells were the same. Or, did Jeff think that "bending" the position of the bells would change their sound, like "bending" his action path? In any case, Jeff's strategies for representing the tune were evidently in disequilibrium: the old ways were coming loose and the new ones were in flux. He was struggling with the problem of coordinating two disparate representations.

With the bells switched, Jeff now heard an entirely new tune: C, C, F, F, A, A, G. Looking hopeless, he again retreated, "I need another bell." I helped Jeff to rearrange the bells and pointed out that a "turn back" in the action path necessitated "skip a bell" in order to go on:



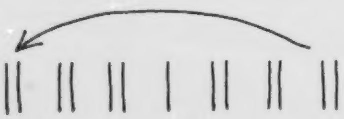
With this in mind, Jeff finished building the tune. He had no trouble turning back to the first bell to make the last event in the tune.[14] His completed, special bell path looked like this:



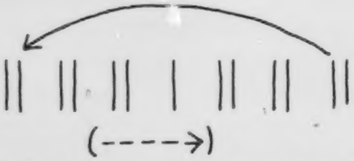
Notice that while bells are ordered according to their occurrence in the tune, there is only one bell for each *pitch-type* instead of one bell for each tune event. Also, the action path has come apart from the bell path; they are no longer merged in a simple congruence. To play the tune, Jeff must now be able mentally to coordinate bell path and action path, to map one onto the other.

Clearly, Jeff's difficulties in this process were related to his struggle with emerging new strategies for representing the tune; there was work going on of a rather fundamental sort. Specifically, Jeff was at work on differentiating bell path/action path, bell object/pitch property, position of bell/tune event.

In one half-hour session, Jeff's instructions for playing the tune on his special bell bath evolved through a series of modifications that again show his transitional flux. On his first try, Jeff's lines seemed to show actions (hits) rather than bells; he "played" the tune on the paper much like Type I rhythm drawers:[15]



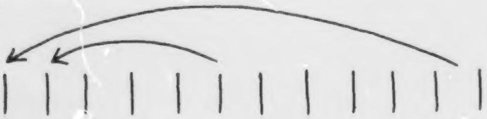
The grouping together of lines shows which bells to hit twice. We could say that Jeff's use of spatial groupings reflected how the actions on the bells occur in space (that is, where the actions "stay put") or they could reflect the two *pitches* that are "close together." Perhaps they do both: they are pairs of events somewhat like figural rhythm drawings that "belong together" or "go together" in both pitch *and* gesture. Jeff has also added a new arrow notation to show the "turn back" in the action path at the end. That the tune "ends where it began" seems a clear and significant feature for Jeff. The "turn back" and the subsequent skip in the middle of the tune, however, is ignored or forgotten. It has again been seduced by the pull of a unidirectional action path—exactly the same problem he had when he tried to play the tune after adding the fourth bell to his bell path. Instead of showing the turn back, the lines referring to hits-bells go straight ahead to the goal of the first large figure in the tune:



This drawing vividly shows the confusions (or fusions) between pitch, the spatial position of bell, the action path, and the temporal sequence of events. Jeff was working on differentiating these various dimensions, but at this transitional moment, he had only partially succeeded, and in addition was faced with the issues of coordinating them.

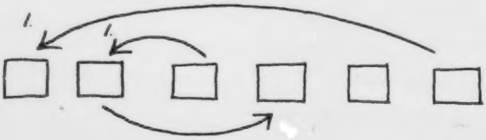
The task of translating experience into a description of it seems to bring issues like these to the surface. For example, the problems of differentiating and coordinating are reflected in the ambiguity of reference for the lines—which seem to represent both hits and bells—and in the ambiguities around space-time. The *real* space of the bells on the table and the actions on them are confused with the *imagined* space through which the temporal sequence of events moves. All these differentiations and coordinations are in flux—there is a lot to keep in mind.

Testing his notation now (playing the tune correctly), Jeff modified his first notation to show the turn back but showed it pointing to the wrong place:



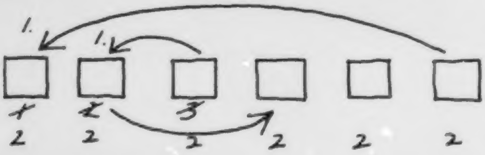
This was partly a result of the confusion about what the lines stood for—hits or bells. In this second notation, Jeff had again played the tune on the paper. The path of lines stood for hits, which this time were drawn equidistant from one another making it impossible to see which hits belonged to the same bell. But in adding the arrows, Jeff needed to refer to the position of a bell in the bell path. So, as he shifted his focus from hits (as he drew the lines) to bells (as he drew the arrows), the second line shifted its referent: first it stood for the second hit, then it became the second bell. I asked Jeff, "How will people know which bells to hit twice?"

Jeff's resourcefulness produced a third notation:



By joining together the pairs of lines that had referred to hits on the same bell, he made the lines into a series of boxes. And with this transformation, the problem of referents for the lines was resolved! The boxes now clearly referred to the bells on the table. There was one box for each bell on the table. With this stabilized, Jeff, with his inimitable ability to invent, was able to use his arrow-action notation to show the direction of the action path (the bends and skips) *and* was able by adding the 1's to show when to strike a bell only once. Boxes show bells and which bells to hit twice, arrows show how to go, and numerals show when to hit a bell only once. But once again the picture is largely iconic: a kind of path-map showing a copy of the bells on the table and how to get from one to the next.

Finally, I intervened once more and asked Jeff if he could "put in some numbers so people would know exactly how to play the tune."



Jeff began to number the boxes serially (1, 2, 3); but when he got to the crucial bend, he rejected the numbers as names for the sequence of events and slipped into numbers as "counts" for the hits. (Can 4 come before 3?) He said, "You play this one twice, and this one twice . . . ." The flux of transition was pervasive. Joining the lines together turned hits into bells; numbers switched from enumerating the sequence of bells (count on) to recording the number of hits (count up). Work was going on, but Jeff still needed to practice his new strategies for constructing and describing the tune and for coordinating old and new strategies of representation. Jeff's behavior through this series of modifications seems to reflect Piaget's (1950, pp. 138-139) description of the transition from "intuitive thought" to "concrete operations":

> Thus we may say that intuition is still phenomenalist, because it copies the outlines of reality without correcting them, and egocentric, because it is constantly related to present action. But this initial state, which recurs in each of the fields of intuitive thought, is progressively corrected, thanks to a system of regulations which herald operations. Intuition, at first dominated by the immediate relations between the phenomenon and the subject's viewpoint, evolves towards decentralization. Each distortion, when carried to an extreme, involves the re-emergence of the relations previously ignored. . . . Each detour leads to interactions which supplement the various points of view. Every decentralization of an intuition thus takes the form of a regulation which is a move towards conservation through the coordination of different viewpoints. Operations are found formed by a kind of thawing out of intuitive structures, by the sudden mobility which animates and coordinates the configurations that were hitherto more or less rigid despite their progressive articulation.

The whole process thus reveals the nature of the learning, of the cognitive work involved as Jeff progressively restructured his internal strategies of representation. Jeff's work included taking a new view: removing himself from the immediate experience on the tune path, getting "up on top of it" to compare events that are distanced in time and space, and thereby discovering identities in pitch property. Distancing himself from the immediate experience of events, he began to have a grasp of the whole. Making descriptions and reflecting on them seemed to be an important part of this transitional process.

To resolve the issues of transitional flux, Jeff needed to make a *mental* construct, a general schema not given in the tune itself, which he can use as a "fixed reference" much as Type IV children constructed a temporal grid. The fixed reference in both situations functions as a stable structure in relation to which any particular event in a tune (or rhythm) can be named, and in relation to which events can be measured regardless of their situation in the tune (or rhythm) and regardless of their figural function.

For Jeff this meant developing the capacity to think of the bells solely in terms of their pitch property relations, that is, to order them in a pitch seriation. Such a structure we call a "scale." But it is important to distinguish between the "tune" one can sing (do, re, mi) and the ordering of pitches with respect to a particular relationship among them. This latter structure can be quite precisely compared with *seriation* in other domains, such as seriation by size (as in sticks). That is, the set of pitches is ordered such that any pitch in the series is equidistant from the pitches on either side of it and can be described as both higher than and lower than another pitch in the series.[16] Thus:

$$A:B = B:C = X:(X + 1) \text{ and } A < B, B < C, A < C$$

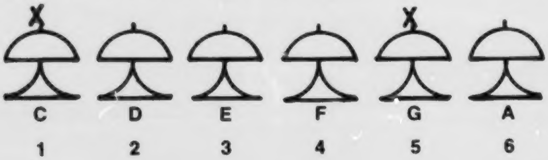
By convention we call this an ordering of pitches from "low" to "high"—language which is, of course, metaphoric and the metaphor is fraught with confusing associations for children and musically inexperienced adults.[17] For example, when I first asked Jeff to "arrange the bells from low to high," he simply made an arrangement of bells that "sounded good," a nice tune. He could, however, construct the "tune-of-a-scale," when I sang it for him. But in the process of building this "tune" and other tunes over a period of several months and after talking about "higher than" and "lower than," Jeff did learn to think and describe pitches in terms of the particular pitch relations that constitute a seriation. When asked to build a scale now, he said of it, "It goes lower and then higher, higher, higher."

Again Piaget's description of these developments as they occur across domains is helpful:

> Thus, quite distinct stages in development are marked, for example, by the point at which temporal relations are merged in the notion of a single time, or the point at which the elements of a complex are conceived as constituting an unvarying whole or the inequalities characterising a system of relations are serialized in a single scale, and so on; after trial-and-error imagination there follows, sometimes abruptly, a feeling of coherence and of neces-

> sity, the satisfaction of arriving at a system which is both complete in itself and indefinitely extensible. (1950, p. 139)

But the capacity to order the bells in this way did not immediately include the capacity to coordinate it with the equally well-ordered structure of the tune. One day after Jeff had built his scale, I asked him if he could play "Twinkle" *on* the ordered bells without moving them. I showed him how to begin playing as far as "Twin-kle twin-kle"—that is, leaping from the first bell to the fifth:



As before when I had suggested a new strategy, Jeff looked puzzled and a little upset. Then, remaining true to his own strategies of representation instead of imitating what I had done, he picked up the C and G bells, hugged them to his chest, and put them down next to one another. He quickly took apart the rest of the scale arrangement and rebuilt his special bell path all in one uninterrupted process. It evidently made him uncomfortable to see the tune looking so different—how could the two events which were next to one another in the tune be so far apart! While Jeff could focus on pitch property and its relations in building the scale, he could not yet coordinate tune and scale, could not yet map one structure onto the other.

Towards the end of the school year, Jeff did make what looked like a leap into a *formal strategy of representation*. That is, he could first construct the scale, then play the tune by searching on the fixed, ordered series for the particular sequence of tune events. This meant moving about on the scale—forward, backward, skipping—through a process of mapping a particular action path onto the scale path. The sequence of tune events was now quite separate from the bell arrangement. Since there was no spatial/temporal congruence between scale path, action path, and sequence of tune events, the congruence had to be constructed through a mental coordination of one set of relations with another. Jeff's instructions for playing the tune were quite remarkable:

$$\boxed{1}\quad \boxed{5}\quad \boxed{6}\quad 5\quad \boxed{4}\quad \boxed{3}\quad \boxed{2}\quad 1$$

The boxes as graphics derived from his previous notation: they showed which bells to hit twice. But their sequential ordering across the page no longer coincided with the sequential ordering of the bells on the table. The sequence of boxes is a true notation path: it shows only the *sequence of tune events*. Bell path and notation path have come apart just as bell path and action path previously came apart.

Making distinctions, however, always requires making coordinations—in this case, coordinating the sequence of tune events with the sequence of ordered bells. Jeffrey achieved this coordination by first naming the bells according to their position in the scale. The numbers in the boxes refer to the position of a bell in the ordered series, not the position of a bell in this particular tune. These names are determined before-the-fact and remain consistent because they derive from a single, stable structure. Further, the same names can apply to events in any tune no matter where they occur or with what figural function: ". . . a system both complete in itself and indefinitely extensible." As a result of this "system" or perhaps coinciding with its development, Jeff's description is no longer iconic, no longer a kind of literal picturing: he has invented not only a system in which names have fixed referents, but also one that symbolically coordinates events in two spaces. He has, in short, invented a coordinate space. The horizontal axis—the progression of boxes and the sequence of numbers across the page—refers to the "tune space" (the progression of tune events on the horizontal axis); the numbers themselves refer to the "scale space"—the particular position of the tune event in the scale grid which becomes the vertical axis in standard notation. Jeff's mental coordination allows him to see the tune as a particular version of the scale. Reflecting on his immediate experience, struggling with its translation into external description, and reflecting on the various forms *that* took, Jeff has come close to inventing the coordinate space of standard music notation.

A formal representation, then, includes the capacity to view the tune *in terms of a single, stable structure* that functions as an outside reference providing both consistent and invariant names for pitches and as a means for measuring pitch "distance" along a grid. But it is important to notice that the emergence of this strategy of representation requires precisely the work that we saw going on during Jeff's transitional phase, specifically the coming apart of situational properties until pitch is not influenced by spatial/temporal embeddings, and the separation of action path and bell path. To do this, Jeff had to practice removing himself from the immediate experience of his "walk" along the tune path marked by its unique chronological ordering of landmarks and the compelling force of their contextual meaning. Once this work was done, a newly constructed, stable internal strategy of representation emerged. Only then could Jeff coordinate the well-formed structure of the tune and the well-formed structure of the scale-ordered bells into a particular coherence.

But notice that as is the case with Type IV drawings, the situational and figural function of events is lost in this "stable" notation. In "getting a fix" on pitch and time, the notation tells us little about the immediate effect of an event as we uniquely experience it in "real time." Jeff's earlier strategies focused on just this flux of meaning—the "same" pitch in another position and with another figural function was "different." Is this, then, a strategy to overcome, to be gotten over? If so, how do we learn to coordinate immediate experience with its translation into formal description?

In answer, let me ask another question: Why all the bother? Why didn't I just give Jeff the scale, name the bells (or color code them, for instance), even start him off with the piano where the ordered arrangement of pitches is all set out in the fixed "terrain" of the keyboard? I believe the answer to these questions lies in the nature of *how* Jeff learned and in the nature of *what* he learned. Jeff began by coming to "know what he knew already" as practiced and projected in his initial tune constructions and descriptions. Then, through the cognitive work evidenced in the transitions, he gradually transformed and enriched his intuitive ways of knowing to include the constructions and descriptions I have described as formal. But notice that in order to do that, Jeff needed to build "coordinating schemas" through which he could coordinate not only tune and scale but also coordinate his earlier strategies with his later ones. Thus, his formal description is not a construct imposed from the outside, removed and disjunct from his own experience, but one that has *evolved* from it. Each of his descriptions was a particular way of shaping his own experience. In the end, the multiplicity of names and meanings that resulted were not a source of confusion but a source of enrichment because they derived from his own cognitive work and could thus be coordinated, mapped onto one another.[18]

This capacity to build coordinating schemas, to make multiple descriptions of the "same" phenomena is, I think, a basic skill, perhaps *the* basic skill in learning how to learn—and that ultimately means learning how to learn something: "math skills," "language skills," and all the rest. Jeff's story suggests that each new way of knowing potentially provides a tool for solving problems appropriate to it; you can come to see a new situation as a version of one that is already familiar. For example: Given the piano, Jeff might see it as a version of his ordered bells; given music notation, he might see it as a version of his last set of directions and as such mappable onto the fixed reference of the keyboard. At the same time, he might shift his focus to seek out the figures, the gestures, and the motives hiding in the score—his own experience tells him that formal notation is only one story of a tune, a middle C on the piano is not always "the same"!

The goal of this process, then, is not Jeff's new formal capacities but rather his new potential for learning and his own sense of himself as someone who can! Thus, Jeffrey's process does not signify a movement away from figural strategies of representation. On the contrary, he was able finally to shift freely back and forth among strategies: flipping focus in ways that lead to the discovery of new salient features and new groupings from which new and different relations surface. His acquisition of formal strategies for representing the tune enables him to coordinate figural and formal representations. His process is a figural/formal transaction, not a transition, and therein lies its power for future development.

And so we have come full circle. Just this transaction and the courage to risk the restructurings that it involves constitute both the means for resolving cognitive dissonance and the moral of the parables. And just this transaction, too, is a necessary (if not sufficient) aspect of musical competence, in terms of the performance as well as the meaningful understanding of music. In order to read music or to play an instrument, one must recognize that a pitch has a single place on the musical staff and on an instrument, a single name regardless of context. But in order to appreciate musical meaning, one must respond to the situational properties associated with the pitch because of its position, its immediate proximities, and the functions of sensory events. (In the end, this may be what we mean by "reading comprehension.") And finally, the very notion of the transformation of a musical motive, so essential to composition and to its understanding, requires discovery of the transformations context can perform on pitches or figures that are formally "the same." Perhaps we can think of "greatness" in music as itself a model of learning.

Conclusions

I think it is fair to say that in early teaching and testing we tend to give priority to skills of formal description and to their underlying strategies of representation, defining *them* as "basic skills." Schooling tends to proceed on the assumption that figural understandings are, indeed, something to be gotten over. For example, they are considered evidence of an earlier stage of development characterized by the inability to hold properties stable in the face of changing routes, spatial proximities, or sequence of events. My observations suggest that the ability to extract and hold properties constant (to measure pitch/time in relation to a fixed reference) coincides with later developmental stages. But when we put a singular emphasis on formal descriptions, we fail to recognize the child's need to discover his or her powerful intuitive strategies and then to coordinate them with formal descriptions, *before* we can expect him or her to cope with the formal descriptions in school. In this sense, it is we who fail to learn, not the children.

And when we do recognize figural skills, we tend to think of them as belonging to a different world: "basic" skills are public, figural skills are private. We think of formal relations as "teachable," and of the figural ones more as a matter of "personal expression," as difficult to communicate, as even a matter of "innate talent."

To emphasize this separation we relegate "aesthetic education" to the "free" part of the day when children are encouraged to be "nonverbal," even encouraged to turn off their "cognition." We do this instead of recognizing that it may be precisely music, as one example, that can provide the *intersection*, the coordinating schemas, the basic skills, the child needs so much in order to cope with the "cognitive" learning we call "basic skills."

And on the other side, when teaching "basic musical skills" like instrumental instruction, the emphasis is often on counting, on playing "in time," on naming pitches, on measuring and recognizing the distances (intervals) between pitches as "the same" in spite of figural function and in spite of the effect of "route traveled." Then we despair as beginning students play rigidly, almost doggedly—every beat marked, every downbeat doubly marked. We admonish the student to "play more musically," to "put in the phrasing," or even to "play with feeling." Only much later in advanced music theory classes do we struggle to help students deal with harmonic and structural *functions*, with the changing meaning and naming of a pitch or figure as a result of contextual embedding, or to help them attend to the rhythmic grouping of events in contrast to the metric groups that so visably dominate the printed page. In the context of these classes, we are explicitly asking students to find the figural groupings and figural functions that were probably intuitively available to them long before. These intuitive skills have been obscured because we as teachers believe in, and focus our teaching on, the particular features of music that are captured by formal notation. If children manage to make the coordination of intuitive and formal skills, it is almost in spite of schooling, not because of it. Notice, for example, that individuals who "play by ear" are rarely heard to perform without a sense of the phrase, without a sense of movement or gesture, and yet we feel these students are often limited in appreciation and performance of music. How can we have the best of both worlds?

Perhaps the focus in research and in teaching should be adjusted to provide for a better understanding of what I have called the coordinating schemas through which an individual learns to integrate and thus to enrich both the powerful intuitive strategies and the equally important formal strategies and descriptions that we univocally associate with schooling and "adult" thinking. What can we learn about the cognitive work involved in building such coordinating schemas? Can we design experimental situations in which to observe and rigorously describe such work? Can we develop ways of teaching that will encourage children to move back and forth freely between these two ways of knowing with each enriching the other? Can we, in fact, encourage individuals to reflect on their own powerful intuitive strategies (what they know already) and then to translate them into external descriptions risking and even using their incongruences with other descriptions? Can we look forward to schooling that seeks out the underlying basic skills that cross domains of knowledge and knowing, that encourage the emergence of multiple descriptions of what we see and hear? Can this kind of schooling become the felt path of personal learning, new insight, and new knowledge?

I began this paper with some questions that now seem only to have yielded some more. In the talmudic spirit of inquiry, I will stop in order to begin again . . .

Cambridge, Massachusetts
June 1977

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NOTES

[1] Cratylus, a student of Heraclitus, is mentioned by Aristotle (*Metaphysics*, 5, 1010a 13) who attributes to Cratylus the belief that you could not step even *once* into the same river, thus going his teacher one better. I, in turn, attribute the source and the paraphrase to Donald A. Schön.

[2] In the spirit of relating several domains, I should mention a factor in my own research (what my computer culture colleagues call a "default factor") that lies hidden in all that I will have to say. That is, in framing questions, in trying to understand what I observe as I search for answers, I often defer to my own musical intuitions as a reservoir that both informs my work and is enriched, even of necessity restructured by it. This requires, as I recognize, that I persistently examine and re-examine my own underlying cognitive strategies (those modes of constructing coherence upon which I depend as a musician). This may seem like an unduly subjective approach, perhaps even an arrogant one, and it may seem far from the paradigms of research called "objective" or sometimes "scientific." I can only argue that such intentional intrusion of my own intuitions and reflections, together with confrontation of match and mismatch as I observe others, keeps explicit what is often left implicit in studies claiming objectivity. Further, as Thomas Kuhn has shown, the most significant leaps of truly scienific research can often be attributed to the capacity of an individual to expose, to reflect on, and then to restructure his or her own intuitive paradigms. In short, I try to practice in my own learning what I shall advocate in teaching others to learn. (T. Kuhn, *The structure of scientific revolutions*. Chicago: University of Chicago Press, 1962.)

[3] Beethoven, *Piano Sonata, Opus 2, No. 2,* Scherzo.

[4] In this story, "the first part" includes the A section of the Scherzo (bars 1-16) and its repetition, plus bars 17-26 of what we would normally call the B section. Notice that the student does not hear the literal repetition of A as "going back" but rather as a continuation. And, indeed, as one listens, it is not the "same" simply because the *end* of the first statement is now joined to the *beginning* of the second statement. This new conjuction, plus the fact that the second statement is actually after or later in time, makes the two statements literally quite different—a fact that is not obvious from *looking at* the printed score. The student's "second part" begins with the upbeat to bar 27 ("the new tune") and continues to bar 39 followed by "the first part again." But notice here that for him, the "first part" is now "longer"—it includes not only the return to A plus the codetta, but also the repetition of bars 17-26. So, once again, the student does not hear repetition as "going back" but rather as continuation which, in this case, joins the end of the return (A') with the beginning of B. It is clear from the student's story that his focus is on "tunes." A new tune generates a landmark; it is thus *tunes* which define boundaries of sections irrespective of their register, their mode (major-minor) or their key, none of which are salient features for him.

[5] Actually, the *sound* of the clap is always of the same duration. When I speak of "the duration of the clap," I refer to an *event* that packages both the duration of the sound and the duration of the silence that together make up the time from one attack to the next. The "unpacking" of this package becomes important later on in the discussion of the Type II drawings.

[6] Notice that Example II.3 looks as if the child is measuring, but measuring wrong. I think a more accurate interpretation would be that the child is using *pictures* of notes much as the child in II.1 uses pictures of circles. That is, in II.3 the child uses ♪ to indicate "gets faster." Obviously he has been shown something about the symbols of standard rhythm notation, but he is not using them to refer to the proportional relations intended by these symbols. Thus, II.3 is neither more right nor more wrong than the other figural drawings.

[7] Type IV or metric drawings are a particular instance of what I generally term formal strategies of representation. Other instances will be discussed in Section III of this paper.

[8] Interestingly, the difference in feature-focus affects just what is heard as "same" and "different" in the Beethoven stories, too. Storyteller 1 hears only "the new tune" in the B section as something different. The many transformations of the germinal motive that Storyteller 3 finds "great" collapse into "the same thing" in Story 1. In turn, Storyteller 3 hears "the new tune" as another transformation, not something new at all but part of the "same" process. The difference, I suggest, is the result of Storyteller 1's single-minded focus on *figures* without paying attention to the particular detailed relations that give a figure its distinctive *character* and structure. Thus, his "sad tune" is a whole new figure; he doesn't hear its evolution out of the germinal motive because he doesn't have access to the necessary level of detail and thus to the changes that it undergoes. Storyteller 3 has access to *both* figural *and* formal relations, and thus can enjoy their interactions as they serve to generate transformations.

[9] Recognizing this issue has helped me to devise teaching strategies that help children to coordinate their figural descriptions with the formal descriptions of SRN. While time does not allow me to tell you about it in detail, I mention it here as an illustration of the productive relation between studies in cognitive development, studies in music and cognition, and their implications for the development of basic skills—not only as they influence musical literacy but also as they contribute to the development of generative concepts upon which the child can build. For a full description of these coordinating schemes, see Bamberger, "The Development of Musical Intelligence I," Artificial Intelligence Memo #342, M.I.T. Artificial Intelligence Laboratory.

[10] For an example of how children can be confused by such rote learning, see note 6.

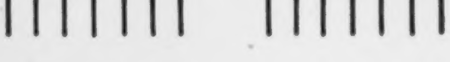
[11] While the experimental data described here are the result of the work Jeff and I did together, the "cognitive work" involved in making sense of that data was done in collaboration with Donald A. Schön. Indeed, large parts of this section of the paper are slightly revised portions of "The Figural ↔ Formal Transaction: A Parable of Generative Metaphor," an unpublished manuscript which we wrote jointly.

[12] While I deal here only with one child, there have been many more participants in the tune-building task, perhaps 30 adults and 30 children between the ages of 7 and 15. Some of these experiments have been videotaped and studied in great detail (see "The Figural ↔ Formal Transaction" for more on this.) The experiments clearly show that Jeffrey is by no means special in his strategies. In fact, *all* adults and *all* children who do not play an instrument or read music eventually construct the tune in much the same way as Jeffrey did at the outset. This seems to me evidence that at any age intuitive strategies are initially figural.

[13] Compare Lynch, p. 83: ". . . recognition may break down when the sequence is reversed or scrambled."

[14] Jeff was helped to accomplish this because the function of the first and last bells as marking the outer boundaries of the tune make them more similar situationally.

[15] Notice, however, that Jeff's spacing of the lines does not refer to the "gap" or time-space between events. Such a drawing would look like this:



[16] This is strictly true only for a *chromatic* scale, not for a major (diatonic) scale, an issue that causes serious confusions later on.

[17] The whole issue of pitch seriation and the language associated with it is a fascinating one. For some of its implications, see "The Figural ↔ Formal Transaction: A Parable of Generative Metaphor," which is referred to in note 5.

[18] I do not mean to suggest that this is the only way that coordinating schemas can be built: clearly the coordination is often made even if one starts off with a formal description or with the "fixed terrain" of an instrument. My point is that if learning is to be more than ritual, if it is to be internalized, then coordinating schemas must be built somehow, (often, I think, in spite of schooling). And most important, any description, any mode of representing phenomena to oneself is best seen as *one* possibility that captures some features and ignores others. While the geography of the instrument and its felt path is a powerful and often necessary mode of internal representation, it is not in itself sufficient.

A Commentary on "Intuitive and Formal Musical Knowing"

I begin my response to Professor Bamberger's paper with the one major reservation I have about it—the lack of consistent attention to musical (aesthetic) responsiveness to the expressive import of music. In connection with the first parable, about listening to music, only Storyteller 1 is obviously responding to the expressive import of the music. He is relying largely on referential meaning as a basis for his response, but his approach is appropriate and useful on the intuitive level at which he is operating. Storyteller 2 is involved in perceiving the externals of musical form and does not integrate those externals into an emotive response to the music. His response is almost purely technical on a low level. Storyteller 3, technical on an advanced level, is in danger of becoming so bogged down in verbal description of compositional devices that his potential for musical responsiveness may be short-circuited.

With regard to this first parable, I raise two questions: (1) How much and what kind of knowledge of compositional devices contribute to musical responsiveness? And (2) in what context can knowledge of compositional devices be developed to contribute to musical responsiveness rather than to interfere with it? With regard to parables two and three, it is important to observe that in neither setting is responsiveness to the expressive import of music raised, and that the problems of patterning and seriation are not unique to music. I raise the question: Would not the resulting impact on cognitive development and the overall effect of the experience on musical responsiveness have been enhanced by attention to the expressive import of the rhythm pattern and the melody? Having disposed of my one reservation, I will proceed to highly positive reactions to Professor Bamberger's paper.

I am heartened to see that Piaget is alive and well in Professor Bamberger's laboratory in the face of the strong bid of the behaviorists

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to take over the world of research in education. One of my greatest professional disappointments has been that my suggestion in 1963 of the great potential of the Piagetian model for research in musical learning has had little impact on research in music education beyond Pflederer-Zimmerman's dissertation at the University of Illinois and her subsequent research with Sechrist at Northwestern University. One may infer that educational researchers, brainwashed by narrow behaviorism and systematically conditioned to the American model of psychological research, find it difficult to take the chances involved in research related to the Piagetian model.

Professor Bamberger's major achievement in her paper lies in not only identifying so dramatically both figural and formal cognitive strategies through her three parables, but also emphasizing the crucial role of intuitive knowledge and figural strategies in early musical learning, and the necessity for interaction among intuitive knowledge, figural strategies, and formal strategies as the learner matures both musically and chronologically.

It is the mode among traditional music teachers to despise or, at best, ignore intuitive knowledge and figural strategies. They feel impelled to get on with the teaching of formal strategies even though a singular lack of success frequently attends their efforts. Furthermore, it is the rare music student who, in the face of overpowering emphasis on formal strategies, continues to meld his or her intuitive knowledge and figural strategies into his or her musical behavior. As a result, we have the stereotypic musicologist who analyzes music "scientifically" without regard for its expressive import, and legions of performers who perform fluently but inexpressively.

In contrast to the traditional teaching procedures, the Suzuki approach to the teaching of the violin capitalizes upon intuitive musical knowledge and gradually progresses to formal strategies. The Kodàly program similarly makes excellent use of intuitive knowledge, and it employs an iconic system of notation prior to the introduction of standard notation. The Manhattanville approach to musical composition also utilizes intuitive knowledge, figural strategies, and formal strategies. None of these approaches, however, provides a consistent pattern of development applicable to all aspects of musical learning.

Professor Bamberger's paper is rife with implications and hypotheses not only for research and practice in musical learning but also for research into the broad field of cognition and into transfer among cognitive processes.

Music would seem to have great potential as a means of entry for research in cognition. Intuitive musical knowledge and behavior are well nigh universal before formal training and are amenable to observation and verification as are few other types of intuitive knowledge. Furthermore, steps in the process of developing figural and formal cognitive strategies are subject to both observation and manipulation. Finally, the intrinsic appeal of continuing experience with musical materials serves to sustain interest and experimental behavior on the part of the learner-subject. What area of learning other than music would have sustained the intense interest of Jeff—obviously categorized, rightly or wrongly, as a slow learner—over a period of six months? These same characteristics recommend music as a vehicle for research into the transfer of cognitive behavior from one realm to another.

Professor Bamberger's paper supports the hypothesis that music has great value in the education of children with learning disabilities. My systematic observation over a period of years has established that it is only in special education classes that most teachers of music are willing to forego their usual emphasis on teaching formal cognitive strategies and permit the children to use their intuitive musical behavior fully and to develop figural strategies in their musical learning. The most effective and affective music teaching I have observed has not taken place in classes of normal children or high achievers but in classes of low achievers and in special classes for children with learning disabilities. Especially in the latter type of class, music teachers apparently recognize that their penchant for teaching formal cognitive strategies is inevitably blunted, and as a result, they attain their greatest effectiveness. Research into the development of cognition in musical behavior among children with learning disabilities and its transfer to other and more generalized behaviors merits increased attention and effort.

The implications of Professor Bamberger's research for the music program itself are numerous, but I will cite only a few. It points to a greater concentration of resources for music education in the early childhood years and the early grades, rather than in secondary school as is present practice. It also raises the possibility of developing a research-based growth gradient that establishes stages of development from intuitive musical knowledge and behavior through figural strategies to formal strategies.

Her approach to teaching music may very well provide a solution to the dilemma facing many music teachers: whether to make the focus of the music class the entertainment of children or the teaching of the so-called fundamentals of music. The usual pattern is to entertain in the early years, by utilizing intuitive musical learning and to bear down on teaching formal strategies in the later years. The establishment of a pattern of movement through and interaction among intuitive knowledge, figural strategies, and formal strategies could resolve the dilemma.

Finally, and perhaps most importantly, Professor Bamberger's paper may give graduate music education students, their advisers, and active music education researchers motivation to break out of the sterile mold which holds many of them in its grip: identifying a problem of more or less significance; setting up variables, some of which are not subject to control; collecting masses of gross data or of precise, trivial data; subjecting the data to every conceivable statistical manipulation; and, so often, arriving at a conclusion of no difference. Design, elegant; results, puny.

My favorite motto, given to me by a former piano teacher who thought I was not daring enough in playing Liszt Rhapsodies, is as follows: "Take a chance; Steve Brody did." (In case you are wondering, Steve Brody was the first man to jump off the Brooklyn Bridge and live.)

Jeanne Bamberger has been willing to take a chance in her teaching and her research. I commend her for doing so.

Urbana, Illinois
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John M. Kennedy

Identification and Different Arts Media

I intend to present here a discussion of "identification," a phenomenon that is just as central to the arts as it is to child psychology, psychotherapy, and sociology. In identification, we take on another's concerns making them significant to us. As Ruth might have put it in a hyperbole: your values become my values, and your acts my acts.

There are two sides to the analysis here. One is more circumscribed and is an examination of the "opportunities" for identification allowed in different arts media. It is more circumscribed because it can be systematic, because it is based on well-defined elements (pronouns of the English language), and because the total set to be considered is clearly limited. To a certain extent, my attempt to set out the defining (essential) characteristics of identification is also formal, in the sense that definitions are always formal choices.

But there is also a more open and less formal show to be mounted. In a series of extended discussions, Richard Pearse, a filmmaker at the Ontario Institute for Studies in Education, impressed on me his puzzlement that audiences are willing to sit for an hour or two and allow a film director to play on their emotions by involving them in urgent and compelling events that are often far from their ken. Richard kept asking me, "Why? Why do audiences do that?" Richard's question is as obvious as and also as provoking as Newton's when he wondered why apples fall. It has all the power behind it that Stephenson recognized as a boy when he saw steam pushing up the lid of a kettle. That we are deeply moved through identification is surely evident; according to Brecht, there is a political danger that we might expiate our sufferings through the release possible in identification. That we are brought out of ourselves and made vividly aware of others' lives is the aspect of identification most revered by humanists. In my less formal deliberations here, I will bring up suitable examples to suggest some of the powers of identification, which can cross sex, age, and temperament to

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allow such matches as a little boy with an Amazon and a little old lady with a Cockney urchin in short pants.

In acknowledging the power of identification as a humane form of communication, I must acknowledge an intellectual debt to Vernon Howard, who was also a participant in the conference at Aspen. He proposes that besides "knowledge that" and "knowledge how," we distinguish "knowing what it is like to." I am struck by the possibility that through identification we can get a sense of what it is like to be another kind of person, or of what it is like to be a person like ourselves living in a manner (situation) that is new to us. During the Aspen Conference, David Olson challenged us to describe what the arts can do that literal instruction and moral instruction cannot. From the present point of view, the answer is that the arts teach us more than mere dimensions of differences and similarities between people, more than what is correct and what is unjust. The arts allow people to know what it might be like to live a life informed by values or ideas very different from their own—be they ideas about honor, or chivalry, or courage, or certainty, or love. They allow us to experience for a while what it would be like to challenge "The Mental Hospital" or "The Army," to admit that it really is all impossible and yet to face "The Plague," or just to turn off the lecturing voices and to dream of the etceteras. The arts can convey "what it is like to."

Is identification a researchable topic? At one extreme, it even challenges ontology, making us debate why one particular collection of neurons is so out of touch with all the others, why it can know other minds only by inference. Personally, I reject this attitude to other minds—it stems from outmoded arguments based on sense data. So phenomenological research on what identification is actually like is required. At another extreme, let us face the fact that the possibilities inherent in identification are not presently fully tapped by the arts, and so imaginative research can be directed at simply defining new possibilities for the future. And, to take yet another extreme, there is as yet no decision on the earliest ages of inception of the various skills necessary for fully-fledged identification.

Yes, research on all fronts will prove profitable, and I will try to point out some research questions that look particularly important today as I continue my discussion. But as all good research relies on good ideas and definitions and as they in turn rely on clearly observed examples, I will try here to develop a colorful analysis of identification that respects the strength and range of my own deeply felt experiences, particularly in encounters with works likely to be familiar to most readers.

Examples of Identification

Some years ago, Olivier's *Richard III* was being shown in a small hall in the Ulster Museum, Belfast, on a wintery Saturday night. The audience only half-filled the hall, all of us sitting on rather hard stackable chairs, our ears occasionally distracted by the clacking sound of a somewhat primitive projector. Not the most favorable circumstances and, of course, Richard is hardly an agreeable fellow. Nevertheless, a group of high-school girls at the front of the house were quite taken by the movie. Richard's sentiments "Was ever woman in this humour woo'd? Was ever woman in this humour won?" drew murmurs and gasps of excited approval. And when the cry "A horse! A horse! My kingdom for a horse!" first went up, it was met with sympathetic groans. Something, it seems, resounded in those girls that evening; they identified with Richard in his successes and trials.

I recall long walks home from the local "flicks" after an hour or two's exposure to John Wayne's devotions to duty and war. For many lingering minutes that young boy had a sense of being six-feet tall and two-hundred pounds of gravel-voiced worry. (A stalwart blonde-bearded Scandinavian, who may remain nameless, confided to me once how he had identified with Bambi!) We may certainly marvel at the range of differences across which identification reaches. I had no trouble identifying with Jeanne Moreau, for example, in *Jules et Jim*—although I confess that at first I automatically followed Jim and Jules, and for the first half-hour I became more and more lost in the movie, which has really very little to do with the two male pawns in Moreau's hands. I hope these examples pinpoint clearly for most readers what we are to discuss.

Most people's early recollections of identifications with fictional characters do not really go back very far. But my own observations support both the common view and the research literature that show children do find the novel people they meet in movies, theatre, and so on quite "imitable" in the operational measure beloved of psychology. The focus in this essay, however, is on the *concerns* of the other, and so another anecdote is appropriate to emphasize "concern" rather than "imitation," and to underline the likely early age of these "concerns."

Brian was less than two years old and was in my arms at the subway platform in Toronto, lest he run around at risk. There were two men working between the tracks, and as always the workmen attracted Brian's goggling attention. When the faint rumble of a train began, Brian's first hint of anxiety appeared. He pointed to the men and exclaimed, "Train! Train!" I tried to tell him they could step aside or submerge via an adjacent manhole and ladder. Brian was barely mollified and said no more, but he clutched me ever tighter, his eyes fixed worriedly on the men. True enough, when the train barreled into the station, the men had descended into the manhole. But, at the instant the train cut over the top of the manhole, Brian flinched, so strong was his feeling for the men in danger. Perhaps I should have let that train go by to show Brian the men were indeed safe. Perhaps I was too impressed by his infant ability to be concerned about others. Anyway, I did leave on the train, trying to assure Brian everything was fine.

Not only must we anchor our discussion with judicious examples, but we must now organize our understanding of (1) the opportunities supplied by the arts for identification; (2) the process of identification itself; and (3) the place of identification via the arts in human psychology, particularly child psychology.

The Opportunity for Identification

Since identification is a psychological process, it is somewhat detached from its physical "occasion," in the sense that words in a novel may "occasion" the process. Obviously then, the response might occur in one member of an audience, while another is left quite cool. One can hardly identify with a character one can barely recognize or understand—and what we identify with in a work of art may change from time to time. We should think, therefore, of the media as providing opportunities for identification to occur, realizing that at the same time the opportunities may be beyond one person's skills, may be just right for a more sophisticated observer, and may be banal for a third, more experienced person. The study of the arts and identification can usefully begin by systematically describing just how opportunities for identifying are presented by each medium.

Are some media more relevant here than others? There are cases across each medium that tempt a No answer. Just notice for a moment that each medium can be vivid and telling, and that each has its own adherents—poetry-readers, moviegoers, theatre buffs, and the like. I know an illustration of the death of St. Stephen that as a child I could not bear. It moves me even now in memory as I recall the gentle figure of Stephen, still tender in death, and the all too human inhumane figures who stand in middle distance, in no man's land lost in a moment of indecisiveness once their passion is spent. As a child, I may have identified with Stephen, though the tragedy in the picture rarely allowed me long to explore it at length. Now I know I am at least in part capable of identifying with those figures caught in the dark aftermath, so it must be concluded that one can identify with static pictures.

Surely each of us also knows some music that invites identification. As for me, Elgar's *"Enigma" Variation* "Nimrod" sweeps me into realizing the nature of parental obligation—a duty gladly accepted, carrying a loved responsibility, and carefully allowing it due freedom. I know of no way to convey this integration of attitude and feeling in a literal description; but once "Nimrod" has evoked the complex, a mere reference to it brings the whole to mind. Hence, music too permits identification. At the extreme, the experienced, practiced mind can even jump at a single word or command into the relevant frame of mind.

But all of these are subsidiary cases. The proper study of identification must not begin with these, although it must be reconciled to them just as a good grammar deals with well-formed sentences and classifies the special cases, too. Primarily, identification occurs with a person, particularly a person in a story. Hence, our main focus here must be on the media that are traditionally and commonly used as major vehicles for stories. The kind of identification opportunity offered by a static image, however allegorical, or by an object, however sacred, is secondary for present purposes. The most common media for stories—movies, theatre, and fiction—are the ones to examine here.

We can think of our main focus in this way: When a story is being told, it generally involves at least one leading character or protagonist. The protagonists are the target for possible identification—their successes are sought, their falls lamented. Once the onlooker is attached to the protagonist by identification, it becomes possible to introduce dilemmas, motives, and circumstances that are often quite alien to the onlooker and to have them matter to the audience. Subsidiary cases of identification are possible: the over-eager onlooker only needs one trigger to be activated, and thus the super-patriot can be drawn in just by the first few bars of a jingoistic anthem. But the most interesting cases of identification involve the gradual involvement of the audience in situations new to them, and hence the storyline that draws the audience in is the thread we must now take up.

Writing, Pronouns, and the Protagonist

How do media actually present a protagonist? Each medium has its own distinctive way of bringing out information about a central character. It will be helpful here to describe the novel first as it is the medium of writing and speaking. It has the advantage of being built on the very system we are using to communicate with—the system of language itself. Many of the key distinctions we require here are readily made with the commonest terms of everyday discussion, and so when we turn later to theatre and movies, we will be able to refer back to these easy to understand and convenient verbal pegs.

The system of concepts we need here involves a person *Ego* faced with a work of art. The novel itself contains certain key elements—terms that refer to the protagonist.

First, *Ego* deals with these elements, if only to recognize and categorize them, picking up information about the referent. Given an evocative work of art, *Ego* not only understands who or what is being referred to, but begins to identify with the protagonist, gradually taking on the protagonist's concerns or point of view.

What are the basic terms used to refer to the protagonist? These terms occupy what we may call the surface of the medium, its mask. They are the first suggestion of a point of view, of a mask the reader can adopt. The common terms in writing about a protagonist are, of course, the first person singular *I* and the third person singular *He/She/It*. The *I* form invites identification (I-dentification!) perhaps a little more readily than the third person form, though this is normally a weak influence, and one can quickly and deeply identify with a *He/She/It* form. Perhaps *I* is helpful to children at times. (To test this view we could check: (1) whether in re-telling an engrossing story, *I* stories are less often transformed to *He/She/It* stories than the reverse; (2) whether *I* stories enable the listener to hold onto personal characteristics of the protagonist more readily; and (3) whether *I* stories are more involving.) Furthermore, special tricks can be played with *I* stories, as in the noteworthy murder mystery where *I* turns out to be the culprit. This murder mystery capitalizes on the reader's standard assumption about *I*, that is, that *I* tells all the relevant facts.

He/She/It brings along as many ready-made assumptions as *I*. In an *I* story, the semblance of knowledge available to only one person is usually preserved—"I found out later that . . ."; "I could only see *X* at the time. . . ." These are locutions that indicate restrictions suitable for a genuine human observer. In a third-person story, the tone can be of the "Little did he know . . ."; "Hidden from his sight . . ." variety. There is an element of useful contrast here; the onlooker is invited to adopt the protagonist's concerns, yet on the surface the work allows distance by using the third person pronouns while giving the onlooker information that would not be available to him or her in the role of the protagonist. Irony is much easier in *He/She/It* works than *I* works; denouement without a sense of being cheated by the author is much easier in *I* works. *He/She/It* works permit the author to be all-knowing; *I* lends itself to human scale.

A story can start more ways than "*I* or *He/She/It* was going down the street . . ." The first person singular and the third person singular are merely the standard forms. Experimental fiction has dallied with other pronouns to good effect. The other pronouns we should consider are *You*, *You* (plural), *We*, and *They*. For convenience, I will use *Yousuns* (an Ulster term) for *You* (plural).

At first encounter, a "You were walking down the street . . ." seems forced. Few works try to carry it through consistently, though there was some interest in the device in the French New Wave of the 1950s. One such story had *You* depart from *Your* wife by train while *You* tried to decide whether to leave her permanently as the train carried *You* to *Your* lover. Typically, I imagine, the first taste of *You* as forced feeding quickly passes, and the enduring impression is of a companion recounting something of the "I remember when you . . ." type. There is an unsettling quality to *You* in the present tense—"Now you are going down the street . . .", "Now you are thinking . . ."—which makes the storyteller begin to sound a little abnormal and rather like a hypnotist! There are special occasions when a *You* story is appropriate, as in a supposed case of amnesia who is being told something he or she ought to recall.

I know of no *Yousuns* story that is a simple parallel to a normal *I* or *He/She/It* story. *Yousuns* best belongs, if it is taken to be a written record of actual spoken words, in a lecture, "This is your teacher talking to all of you," or in an announcement, "This is your captain speaking. The tail is on fire. I have bailed out. This is a recording." It is a powerful device in a diary (in something like the last entry of Scott of the

Antarctic) or in a last will and testament. It simultaneously brings immediacy to the ghostly speaker and intriguing indeterminacy to the intended audience.

We is a strange protagonist, particularly for such a solitary occupation as reading. It invites the reader to belong to a group and hints that the sharing in the group has reached a level of community that is unexpected though dearly wished for in this day and age. It can be a cheap deceit, preying on the lonely. It can be the rather soulless *We* of an elementary science textbook talking of mankind—I have used it above in almost that way, though I intend it to be warmer than it normally is in "How we evolved . . ." *We* with its threat of exclusion, superiority, and the like is a dangerous pronoun in Fascist literature. It is considerate and embracing in a letter: "When we took that drive into the hills around Squamish, and the sunny weather matched our feelings."

They is dangerous country. No longer the single *He/She/It* akin to the reader, *They* can be a powerful threat, an anonymous mob, those who make us paranoic. Yet *I* can identify with *They*. There is a brand of speculative fiction where *They* stands for the fruitful mass of humanity pushing to the (six?) corners of the universe, as inquisitive as puppies and as mysterious as the tides. The beckoning author is asking us to belong to humanity at large, to feel the sweep of history and a tug from the future. Is this just an anomaly in the ethnic narrowness of our normal birthright?

Can children even identify with such a protagonist, ever find *They* on such a scale attractive? Perhaps—and we must try to find out. One incident brings me hope: Two-year-old Robert told his mother when she explained at the beginning of the circus about standing up for the national anthem, "That's silly. People should stand up for the world." If the idea can be grasped, identification with it can surely follow.

I have tried here to explain briefly some possible opportunities for identification, hinting at some dimensions of the experience and presenting examples in evocative language. Put baldly: Ego is offered *opportunities* for *identifying* with *characters*, and in literature the opportunities have the pronouns *I*, *You*, *He/She/It*, *We*, *Yousuns*, and *They* as their superficial structure (surface or mask).

We shall shortly turn to asking whether the superficial differences in structure have underlying invariants (a deep structure) in common. But first, let us ask whether there are equivalents to the pronouns in other media: in movies and in theatre.

Cinema

No one who has seen children at a pantomime or who can recall Saturday matinees can doubt that children can identify strongly with both live and canned protagonists. Here let us examine the mask film uses to give the onlooker access to the protagonist.

Characteristically, the cinema gives us a view from a disembodied eye. The viewpoint presented does not correspond to that of any particular person. The aim of each scene is to provide information, and while the camera can provide a longshot or a bird's-eye view, the most we are expected to get is a *tone*—a comment as divorced from an actual viewpoint in life as italics are from pronouns in writing. The audience need not suppose that any of the people in the filmed story is at the vantage point from which the audience is supposedly seeing.

The cuts, pans, and zooms that link one cinematic moment with the next emphasize the disembodied nature of the camera. No individual need be supposed to be engaging in a series of glances corresponding to the sequence of cuts. No pair of eyes is turning if the camera happens to pan along the course of an arrow. No one need fly ever closer to Juliet as the zoom takes us up to the balcony and into her room.

The disembodied camera can be all-knowing; for instance, allowing views on two sides of a wall to emphasize the symmetry of joint preparations for battle. This is the cinema's equivalent to the written *He/She/It:* the scene is being examined by a detached observer who does not exist in the world of fictional events forming the story.

Occasionally, the camera viewpoint duplicates the perspective of the protagonist. In one movie, the chief character is Jesus Christ, but the audience never sees Him. Everything is taken from His viewpoint—the crowds surround us, as the crowds surround Him. In a television series called "You Are There," each episode was shown from a single viewpoint theoretically corresponding to that of a participant in the events. These uses of an individual's visual surroundings correspond to the *I* stories in their adherence to a person's limitations and to the fact that *Ego* is supposedly being given the impressions of an active contributor to the world of the story.

The extended use of the *I* viewpoint in a movie is generally tiresome. Its occasional use, however, can be explosive: a sudden switch to the viewpoint of one member of a pair enmeshed in an imbroglio, or the rushing visual world of a pilot about to crash, or an impression of a trapped prisoner, or a view of the unsuspecting walker who does not know what lies in wait around the corner, and so on. There are times when the *I* viewpoint is vital: in a Bergman movie where a helicopter is taken to be a strange messenger, and in *Blow-up*, where a photographer's life is disrupted by an impression that needs verification. (Cortazar, the original author of the *Blow-up* story, often makes remarkable use of viewpoints and identification in his short stories.)

When a movie was made of the story about the *You* in a train deciding between lover and wife, it was made with an *I* viewpoint. It seems physically impossible to distinguish clearly between *You* and *I* in cinema viewpoints, at least in the way that there can be a sharp distinction at the most immediate level in writing. Correspondingly, no sharp distinction can be drawn between *We* and *Yousuns* in the cinema. In effect, there is no *You* in the cinema. At best, there is that terribly canned feeling of a Mr. Rogers saying to "the kiddies" via T.V., "How are *you* today?"

Is there a *They* for the movies? How would it be possible to distinguish *He/She/It* from *They?* The condition would simply occur when several protagonists are being seen from a viewpoint that corresponds to that of no one in particular. The crux of the matter is that the audience is not seeing from the viewpoint of someone who is a target for identification, but it is being asked to take several people as equally the target for identification. When our cowboy or macho heroes are "partners," with minimal differences submerged in say their daring, bantering, and devilish attitude to one another, then the audience is expected to enjoy being part of a group, to enjoy being a *They.*

There is a trivial trick that can be used to distinguish *I* from *We* in cinema. The screen can be divided into sections, each one devoted to one protagonist's viewpoint. In *The Fly* in a curious variation on this trick, the screen suddenly shatters into a thousand identical pictures of the screaming girl who suddenly intrudes on the man whose eyes have become like those of an insect. Her single view of him is instantaneously switched with his multiple views of her.

Live Theatre

The theatre with its flesh-and-blood actors and its unwieldy stage may seem less flexible than the cinema, but the live quality in fact means it can engage more viewpoints than cinema and can rival the range of the novel.

The standard vantage point in theatre is one that corresponds to the third person singular *He/She/It.* The standard effect is that of a transparent wall in a room or of a convenient balcony on the street, and so on. The stage is set to present a scene in which the protagonists appear before us: we do not actually see from their position, we only see them before us, and our vantage point is not that of someone in the unfolding story. We are invited to identify with someone who appears before us (*He/She/It*) or with some people (*They*) who are presented.

At first thought, the standard viewpoint may seem the only one. But note: in live theatre, the audience can genuinely be addressed by the actors, and furthermore, the audience can indeed be engaged in the unfolding scenario. In *Zoo,* a jury visits a prison to confront the inmates. In a neat device, the jury in one production I was in filed out from the wings to line up facing the audience, while mammoth shafts of light imitating prison bars fell on the jury. The jury pointed into the audience, gawked like visitors at a zoo, and made comments on the actual members of the audience—a captive audience *par excellence!* It is not hard for an audience in these circumstances who hear their clothing and hairstyles mentioned from the stage to put themselves in the place of the *Yousuns* addressed by the jury.

I have not seen a play in which there is a single *You* addressed by the actors. To imagine one, however, think of a play about a character who is dumb and perhaps retarded, too. Imagine that the cast treats the audience as though the audience were physically in the place where this character is sitting. If the cast continually passes remarks about this character while looking at the audience and guessing about his (unseen) reaction, then the audience is at the vantage point of the *You* being spoken to by the cast. *You* are asked, "Do you want to go out?" *Your* non-reaction is interpreted as, "Oh, now, even if you don't want to, there's no need to be sullen." I expect this device could be barren in a poorly written play, but if *You* are a gagged prisoner or bedridden and unable to speak, it could be used to some effect, albeit one that could be frustrating with its double sense of participation and powerlessness.

What about *I* and *We*? What are their parallels in live theatre? The feature that distinguishes them from *You* and *Yousuns* is the way the audience can be engaged. Not only can the audience be asked to accept itself in the place of a *You*, but it can be invited to influence events and to become the *I* who influences and decides and participates. If the drama is about a person in a group, members of the audience can be invited to be participants: each one is allowed ad-lib ranges, and each is expected to take home what was done rather than what was seen as the focus of the experience. This is the heart of psychodrama and also the thing that can make a child's experience of improvisation rather special. (It is provocative—even dangerous—in risk-taking hands, as Fowles's *The Magus* reveals in chilling ways.)

For the participatory *I* to become *We*, the audience must equally share a real sense of being members of a group, and since the invitation to join in the drama is generally issued to the audience as a group, this feeling is not hard to maintain. Indeed, making the participating group become individuals first and a group second means breaking more barriers than the reverse.

Embedding

It is important for us to note briefly that one viewpoint can be embedded in another. In language we have to understand the rules: (1) I am I for me when I speak; (2) You are I for you when you speak; (3) I know you know rules 1 and 2; and (4) You know I know rule 3. This is a sequence vital to social life—without it, and the possibility of an infinite regress, communication as we know it would break down. Reciprocal role-taking in games involves similar sequences, and the embedding operation is found in number sequences, in perception (for example, in induced motion), and so on. In the arts, embedding is vital for both actor and critic who must know how to fit intersecting points of view together.

In identification, interlocking and embedded points of view are crucial to comprehension and are well-understood even by preschoolers. Take A. A. Milne, for example. In one short Winnie-the-Pooh story, You can refer to Winnie, to Christopher Robin the boy-in-the-wood, to

Christopher Robin the-supposed-audience-for-the-story, to A. A. Milne the-storyteller-in-the-story, and so on. To keep the referent straight, the four year old must keep track of the embeddings: the true situation in which he or she is sitting listening, the first level of the story, the embedded story-in-a-story.

Similarly, a memory-sequence or dream-sequence may be embedded in a film using a special *I* vantage point within the general story, and then embedding a *He* scene within the *I* sequence, and so on. In *Petulia*, many memory-scenes with different vantage points were distributed throughout the movie. In this case, no special techniques (like fade-outs) were used to alert the audience and to help them keep track of past and present. The end result was a fascinating but confusing movie that could only be sorted out by knowing the story (which required two or three viewings) and making some inferences about the likely story. Similarly, *Last Year at Marienbad* had a superficially elusive quality in which dream and reality were not clearly marked off as vantage points and changed mysteriously.

In sum, although there are dominant points of view in a story, alternate points of view can be embedded *ad libitum*, and comprehension depends on following the number and type of embeddings.

Identification with a Character or a Theme

In *Little Big Man*, Dustin Hoffman plays a white man, captured by the Indians, who sees a massacre of an Indian village by the cavalry. Here, the audience is invited to identify with the character of the "standard" American who allows us access to the Indians. We find it easier and easier to identify with the Indians, and then we are exposed to a disturbing battle between Indians and soldiers. Lest the lesson be lost, one member of the audience on the night I saw the film, called out, "That's what we're doing in Vietnam." We do not wish to identify with the aggressor, but as we see the vicious "heroes" of the frontier wearing their fine uniforms and sparkling sabres, we realize what is expected of us. But, as that moving voice from the stalls insisted, the theme is not the frontier or the cavalry, nor is it government policy, rather it is man's inhumanity to man. Without that theme, the film is political flagellation. With it, the film may reach us all.

Thus, characters can represent ideals and peoples, and events reflect themes, and stories reflect attitudes and principles. Stories are the preeminent means for introducing us, via characters we can identify with, to themes and causes we can learn to take to heart. Here then is a second kind of embedding: seeing the particular character as a representative of something more general, and perhaps seeing the first abstract theme we detect as an instance of a still more general theme, and so on.

At this general level of analysis, many of the differences between art media drop away. Any medium can embody an attitude, can give substance to representing an ideal. We should, however, distinguish being moved by a work from being moved and identifying with a work, just as we should also distinguish being shown a place from knowing what it is like to live there. Identification requires both emotional involvement and a special kind of comprehension, that is, caring about something and knowing what it is like to live a life formed by that something. The great virtue of a story is to provide a person and a conflict that sharpens one's feelings of concern for that person, and also to be a vehicle for details, the details that permit well-informed comprehension.

In sum, while it is without question important to see more and more general lessons in a story, the particular world in which the lessons are worked out is more than simply a vehicle for the author's moralizing. One does not use the character and the setting simply to point to abstract ethical statements.

Identification fully used has at least three components. The first is the setting: Is the world of the story acceptable as a ground for the story's figure? Is it convincing, is it an invariant against which this story is a particular? (Notice how settings like the Wild West, Dickens' England, Yeats's Ireland, Dostoyevsky's St. Petersburg have a vitality beyond their role in the individual stories set there.)

The second component is the cast of characters that is usually assembled around a protagonist and secondary actors. As Vonnegut has pointed out in *Breakfast of Champions*, even real history is told as though it is all right to kill off secondary characters. Vonnegut's response is to make the editorial author intrusive so that commentary accompanies events, and to diminish the main/secondary distinction. His ironical commentary with its ethical undertow compensates for the evident loss of contrast when the main character loses his or her egocentric importance. Most authors eventually come through their work as living presences among the characters, just as Hemingway invariably emerges as the honor-wrapped hunter in his writings. We then identify with the images Hemingway, Oscar Wilde, Shaw, and Doris Lessing present in their writings rather than any individual they are writing about.

The third component of identification is the overall lesson or tone. The main impression of a work can not only be summarized in a precept like "man is inhuman to man," but it can be less of a comment and simply more of a topic. Thomas' *Under Milk Wood* conveys a sense of innocence, despite the gossip, the immoralities and amoralities, and the lost hopes. Fellini's *Amarcord* is both a setting—an Italian village—and a tone of unselfconsciousness about exposing onself to ridicule, so that one can laugh at oneself and even blush a bit but not be ashamed. *Amarcord* is a family where nothing is completely secret, nothing is entirely sacred.

When it works best, identification is being involved with the protagonist, responding to the setting—and loving the atmosphere of the work.

Disbelief and Acceptance of the Stranger

Identification via a work of art is not due to "the suspension of disbelief." The rare or apocryphal hayseed who interferes in the melodrama on stage is just that—rare or apocryphal. Rather, the sense of closeness with the protagonist that identification brings means that certain barriers have been lowered; namely, the universal barriers of privacy, of distance between ourselves and a stranger.

If our neighbour in a bar were to tell us about central events in his emotional life, our reaction would be alarm, a feeling that this person confides too much, too quickly. The same events disclosed just as rapidly in a play or a novel, for example, in one of Liv Ullman's relentless searching monologues, give us great interest. Although the protagonist is a stranger, her enclosure in a work of art allows us to suspend personal defenses against the unknown. We have confidence that our trust will not be violated, we accept her as an insider, and she is due all the care we owe someone who belongs to us.

This suspension of our guard against strangers is accomplished quickly. Typically, all we need to know is who is the protagonist. Most works usually point unerringly at the protagonists, and once we recognize them, we follow their fortunes, "on their side" as it were. (Notice how I was misled by the title *Jules et Jim* and found myself on the wrong side.) This selectivity is to some extent a skill: we might search a long time in a complex work to find someone to identify with. Some authors wish us to withhold identification. Indeed in *Amarcord*, Fellini makes the village "historian" a butt of children's jokes, lest we try too hard to see through the historian's eyes. The typical story, however, rapidly introduces a hero and follows him or her consistently to the end.

Identifying Identification

What then is identification? The process of identification, in so far as the arts are concerned, involves accepting another person, usually in a matter of minutes, as related to oneself so that the person's good fortune is to be desired and his or her misfortune is sad to us. The initial factors that encourage identification may be perfectly simple: it may only be that the other is the central figure of a story, or that the other is in some respects like us. In more sophisticated forms of identification, the *raison d'être* of the other person's role in the artwork may be realized, and the guiding principle or spirit of the work may be identified with, with the protagonist acting as an exemplifying figure. The protagonist, once identified with, offers us the opportunity to discover "what it is like to"—to be in that setting, to be that type of person, to be faced with those dilemmas, and to take those actions.

The arts give imagination vital social power. Identification enables the mind to adopt new vantage points—not just to know that others live differently, but to understand what it is like to live as those others live. Imagination, via identification, pulls us out of the market place of our own concerns and gives us a sense of what it is like to have different concerns. The arts supply opportunities for identification and enable identification to take place readily by providing vehicles that stir us as the beholder, that inform us in rich ways, that attract our attention, and that hold us with suspense and mystery that are the more provocative because we are involved and find ourselves identifying.

Understanding others is no easy task, and taking their part is unlikely, especially if their difficulties are not ours or are opposed to ours. Through identification, however, we can be enticed into a deep appreciation, into a heart-felt and deeply motivated sense of people who are different from us. We can recognize through identification how the meaning, the reward, and the pain that the world provides to others are subtly distinct from our own. Instead of simply knowing that the customs of others are not our own, we can sense how they feel about their symbols and rites, their rituals and important events. Inevitably, we will see that while others' lives are built from their own materials, the ultimate important events—birth and death, trust and anxiety—provide universal perspectives from which every life can be viewed, for there is common ground for us all. And so identification through the arts is a tool for achieving fellow-feeling; it produces fellowship across a diverse society that contains (and respects) differences, and it enables deep understanding—motivated appreciation—to take place across differences of age, class, race, religion, sex, indeed across any of the major sources of diversity in humanity.

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David W. Ecker / *A Response to Kennedy*

The Many Kinds of Identification

That the arts can be profitably investigated by relating artistic and aesthetic phenomena to cognitive processes has been amply demonstrated by many participants during the conference. It is evident that the regulative principles and concepts governing the hypotheses, the kinds of data analyzed, and the conclusions drawn about the arts have come largely from the discipline of cognitive psychology. But we should remind ourselves that the arts—and, indeed, cognitive processes—may be investigated from a number of vantage points. Epistemology, anthropology, sociology, art history, and aesthetics immediately come to mind as disciplines representing alternative modes of inquiry by which often identical or similar phenomena are investigated. And it is interesting that there is considerable overlap in the vocabularies incorporated in these disciplines; for example, "art," "aesthetic," "symbol," "cognitive process," "perception."

This fact can be quite misleading, however. The shared use of the word "perception," for instance, by researchers in these different fields can give the unwary listener (or reader) the mistaken impression that a concept is also being shared. He or she might also think that while there may have been technical disagreements along the way, diverse investigators of the same subject matter could and would eventually agree on the basic skills involved in, say, aesthetic perception. Yet the word "perception" may label quite different explanatory concepts, while an identical concept may well have different labels attached to it. And the phrase "basic skills" itself may not stand for the same referents across disciplines. John Kennedy's presentation may illustrate the general problem of reducing the basic skills identified in the arts and aesthetic education to those amenable to cognitive psychological analysis.

While thinking about John's remarks, I began to jot down those idiomatic expressions that included the word "identification" or its derivatives, since the "process of identification" was evidently to be

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considered as a basic skill in the arts, or at least as a central feature of one's response to those artistic media involving a fictional character in a story—movies, theatre, and novels. It then occurred to me that I should make two lists: the first to consist of ordinary usages that had no direct connection with art, and a second to consist of those that did. And beyond usage, I wondered whether there are *kinds* of identification. I would like simply to read my examples with a few comments, and then to bracket a specific problem for us to consider.

Here is my list of identifications that are not art-connected.

1. "That child really identifies with his father (or uncle, grandfather, sports figure, as the case may be)."
2. "He has no sense of self-identity."
3. "I really can't identify with Anita Bryant's stand on gay rights." Comment: This is not a question of self-identity nor of identification with another person—certainly not Anita Bryant; but it is apparently a psychological report of the speaker's relationship to a political, moral, or religious viewpoint.
4. "Let's listen to Uncle Walt." The speaker is referring to Walter Cronkite and his evening news telecast. Apparently large numbers of Americans identify with him, that is, want his version of the news.
5. "I can really identify with those cops." This statement comes from a television show I saw where the subject was violence in the Bronx. It was a filmed documentary of a project in which community leaders and others were invited to join policemen on the night shift. The social worker, lawyer, businessman, parent, or politician actually rode (with the cameraman) in the police car throughout the night to observe firsthand the handling of unfolding events—a knife-fight, a fire, a wife-beating, a drug arrest, and a reported mugging—all of which were "on camera" for the television viewer as well. The thesis of the documentary was that this mode of identification with community problems raises social consciousness by making the problems real to the observer/participant.

Here is my list of art-connected examples of identification.

1. A man leaps on the stage in the middle of a melodrama to prevent the murder he believes is about to happen. Comment: This hypothetical incident comes from Edward Bullough's essay, " 'Psychical Distance' as a Factor in Art and an Esthetic Principle," widely reprinted in anthologies in aesthetics. Given Bullough's conception of psychical distance, one might accept the subject's identification with a fictional character in a story as evidence of the successful completion of a certain kind of cognitive process while judging the same phenomenon as evidence of the failure of the subject to have an aesthetic experience or of the writer and/or actors to provide one. Complete identification would be called "under distancing" in Bullough's terms, but one can also fail to experience an object or event as art by "over distancing."

2. Captain Kangaroo opens his television show by welcoming everyone with him in the studio: "Hi, Mr. Greenjeans. Hi, Bunny Rabbit. Hi, . . ." Jay, my three-year old son, joins in immediately with his own welcome: "Hi, Captain, Hi, Mommy. Hi, Daddy. Hi, Gregory." Question: How are we to understand the identification involved in the child's response to a social situation involving fictional and real characters?

3. "He is riding his motorcycle." Another son, Gregory, provides our third invitation to think about identification in the arts, this time in relation to a child's drawings. In my own research I have attempted to describe artistic activity involving language in the following terms: telling a story, presenting, showing, remembering, incorporating, intending, and acting out. In a three-year longitudinal study, I recorded what Gregory said before, during, and/or after the making of a drawing or painting. Surely Gregory was not only depicting the action in my example but also participating imaginatively in the action he was depicting. The subject matter of other drawings included various combinations of people, monsters, machines, and houses, in real and invented scenes. Occasionally, a drawing was made just to make some marks on paper, but it then became the stimulus for a story he began to tell or depict in the same or a new drawing.

We could add to these lists, but I think the challenge is clear. An explanation of the process of identification must among other things be able to distinguish what features these examples have in common as well as what differentiates them. If an analysis of identification really can illuminate what artistic activity has in common with other human activities, then the aesthetic education movement will have gained an important concept.

I would like to leave you with a more specific problem, one that is a challenge not only to researchers but to parents, teachers, and others. How does the *child* distinguish between the actual violence in the Bronx, its documentation on camera, and the simulated violence in the cop stories dominating prime-time television viewing? And if some children cannot, how are we to teach them to do so? It seems to me that this should be one of the concerns of aesthetic education.

Aspen, Colorado
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Nancy L. Stein

The Comprehension and Appreciation of Stories: A Developmental Analysis

The study of stories as an art form has been a topic of great interest for many decades. To be able to discover those variables which predict who will become a great novelist, writer, filmmaker, and so on is an important concern for many people in both the arts and the sciences. In order to begin an investigation of this art form, however, it is appropriate first to ask exactly why the comprehension and production of stories or literature is such an important goal and why we feel that children would benefit from a greater understanding of the arts. Although the former question has many answers, it is a good beginning because one's answers will probably predict the direction of future research efforts in this area.

One of the chief reasons I have chosen to study the comprehension and production of children's stories is the importance of the functional uses of stories in society. If one looks back through history, several different uses emerge. In many cultures, the story is the main device through which societal customs, regulations, and moral codes are transmitted to the young. In non-literate societies especially, the story has great judicial significance. It is important for individuals to comprehend both the moral and literal meaning of these stories, for in many instances, one's survival depends upon the interpretation of a story.

A second but related function of the story is its service as a vehicle for transmitting internal states and thinking processes. It can elucidate how people arrive at decisions, what types of knowledge structures they work with, and how various external events affect them. The transmission of this type of information is critical because the events which occur in many everyday interactions are sequences of actions from which one must infer exactly what the internal feelings and thoughts of people are. Stories are an excellent technique for transmitting knowledge about internal states in order to validate one's perception of everyday interactions.

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A story can also provide information about a temporal sequence of events by documenting the overt interactions between two characters. It can then take one character's point of view and reveal how that character perceives the sequence of events and how he or she intends to respond to them. Additionally, contrasting points of view concerning the sequence of actions can be indicated so that a reader can acquire knowledge about the differences in the two characters' perception of the same event. Thus, the story is a mechanism that allows people access to knowledge that cannot actually be seen in everyday events.

A third attribute of a story is that it often allows the reader or listener to experience a sense of time different from what he or she experiences in the normal course of events. Although external behavior necessarily entails a temporal sequence of actions and events, the cognitive plans that people formulate to carry out actions need not occur in a strict temporal order. In many stories, the author shows that associations and relations other than direct temporal cause-effect links are an integral part of a character's plan to obtain a goal. "Remembered" experiences may affect how a character established a plan of action. Often the plan will first be affected by immediate experiences that may cause the protagonist to remember past experiences associated with the desire to obtain a goal. In fact, the character may mentally shift back and forth through time before constructing a well-ordered plan to obtain a goal.

Associated with such temporal manipulations are flashback techniques through which a later event in real time is introduced in the beginning of an episode or those where the characters' motivations for performing an action are given at the end of a sequence. In fact, many novels disrupt the normal sequence of events to highlight or contrast an ongoing event with either a similar event that occurred in the past or one that will occur in the future. As we begin to explore the data available on children's and adults' comprehension of stories, it will become apparent that although some of these techniques disrupt the encoding process, certain temporal manipulations of events actually improve memory and may affect the number and type of inferences made by a listener. The researcher can determine what types of temporal organizations in stories increase or decrease comprehension.

Just as stories serve many different functions for the listener, they also serve a variety of needs for those who create them. This form of art has been used for purposes as widely varied as gaining political control over vast populations or increasing self-awareness and understanding of interpersonal interactions. Whatever the various purposes and motives writers may have for constructing a story, there are some common goals and outcomes occurring as a function of writing narratives. In order to understand how stories are constructed, it is necessary to understand how the acquisition of skills necessary for comprehending stories develops.

In order to begin an investigation of how people attempt to remember narratives, I have made several assumptions about the nature of human behavior. The first assumption is that all behavior is goal directed. Whether or not this goal-directedness is inborn or learned is a question that will not be discussed in this paper. Even in the simplest patterns of behavior, however, one can see order, consistency, directionality, and structure. An additional assumption is that a basic set of goals exists which is common to all people, independent of their specific environment. The drive for survival and the human's ability to adapt intelligently, in the broadest sense, are constantly at play. From the very beginning of life, the human engages in behavior and thought processes indicative of the desire to "obtain" a goal, to adapt, or to survive. Support for these assumptions can be seen in the various types of strategies and behavior sequences that occur throughout the life span. More importantly, this goal directedness and sequence of cause-effect relations are at the very core of the definition of a story.

Close examination of stories from a variety of cultures shows considerable regularity in the structural organization of these narratives. Despite variation in the content, certain consistencies in the generic types of information occurring in stories and in the relations between the pieces of information do prevail. In all stories, there is an introduction of a protagonist(s) and a description of the setting or context for the remainder of the story. There is always some type of goal-directed behavior. Either the existence of the protagonist's goal is implied by the occurrence of external factors or the goal is directly stated. Often the character's plan for obtaining his or her goal is given. The protagonist then acts to implement the plan, and his or her actions result in the attainment or nonattainment of the goal. Although stories vary in their specific structure, all stories more or less conform to this pattern.

Bartlett (1932) was one of the first investigators who attempted to describe how stories were remembered by introducing the concept of a mental structure or "schema" to account for subjects' ability to remember stories. Because he found that subjects rarely recalled stories in the exact form that they were heard, but instead transformed the data and included information that had not occurred in the original story, he hypothesized that story memory was not only a function of the structure of incoming information, but depended upon the strategies, mental operations, and structures already acquired by a listener. In fact, the concept of a mental schema is perhaps Bartlett's major contribution to the study of psychology and has greatly influenced the investigation of story comprehension.

To Bartlett (1932), a mental schema represented "an active organization of past reactions and experiences which are always operating in any well-developed organism." He emphasized the reciprocal interaction between incoming new information and existing mental structures by stating that incoming information is actively integrated into a subject's mental structure while the old structures are at the same time modified by the presence of new information. Gradually, if the same type of new information occurs repeatedly, new structures will emerge from the old one and will enable the listener to encode the new information more quickly. Bartlett went on to describe the consistencies and variability of story recall by stating that although he believed these schemata to be stable and shared by individuals over given cultures, differences in attitudes, interests, affective and cognitive states could also produce variability in these structures.

Although Bartlett's work touched upon many of the issues in the field of story comprehension, his notions were vague and incomplete. For example, we cannot clearly grasp the exact nature of a story schema from Bartlett's initial description, nor can we define the types of strategies and the operations used during the act of encoding stories. A model that formally characterizes a story schema is necessary if we are to understand exactly how one does comprehend and produce stories. By describing the types of structures that guide the comprehension process, we can begin a systematic study of the changes and variations occurring in the representation of stories, as functions of both developmental age and individual variation.

Chris Glenn and I have constructed a story grammar describing the rules used during the process of encoding and recalling stories (Stein and Glenn, 1977a). Our initial description was similar to Rumelhart's (1975) schema for story recall but varied in terms of the complexity of the story structures described. Other story grammars have also been constructed (Mandler and Johnson, 1977; Rumelhart, 1975; Thorndyke, 1977). Despite variations in these grammars, an assumption in all of them is that listeners use some type of schematic representation of stories to guide the encoding and retrieval process. These schemata can be defined as the expectations people have concerning the parts that should occur in stories and the relationships that should occur among the parts. We have assumed that these schemata are activated during the encoding of story information and that they are used to organize incoming information in terms of deleting, adding, or transforming various parts of a story.

Some further assumptions were made about the rules used during encoding and retrieval. The first was that listeners expect certain types of information to occur only at particular places in a story and that these different types of information do only occur at specific places in the story structure. Moreover, the events in a story are expected to proceed in a logical fashion. Certain types of events precede other types of events, with one event causing the occurrence of a second event or setting up the necessary preconditions for the occurrence of the second event. Based upon these assumptions, a series of critical hypotheses were constructed to predict how story information would be encoded and retrieved. One major implication of our assumptions is that there may be an ideal structure used during the comprehension process, and that stories violating this structure will not be remembered as well as those conforming to it.

Figure 1 represents the set of categories or types of information into which a simple story can be divided. Essentially, the basic structure of a story can be defined as a setting plus an episode. The setting introduces the protagonist and normally contains some information about

Figure 1

Story Categories

Categories Included in a Simple Story

1. Setting	Introduction of the protagonist; can contain information about physical, social, or temporal context in which the remainder of the story occurs.
2. Initiating Event	An action, an internal event, or a natural occurrence which serves to *initiate* or to cause a response in the protagonist.
3. Internal Response	An emotion, cognition, or goal of the protagonist.
4. Attempt	An overt action to obtain the protagonist's goal.
5. Consequence	An event, action, or endstate which marks the attainment or nonattainment of the protagonist's goal.
6. Reaction	An emotion, cognition, action or endstate expressing the protagonist's feelings about goal attainment or relating the broader consequential realm of the protagonist's goal attainment.

Example of a Well-formed Story

Setting	1. Once there was a big grey fish named Albert 2. who lived in a big icy pond near the edge of a forest.
Initiating Event	3. One day, Albert was swimming around the pond 4. when he spotted a big juicy worm on top of the water.
Internal Response	5. Albert knew how delicious worms tasted 6. and wanted to eat that one for his dinner.
Attempt	7. So he swam very close to the worm 8. and bit into him.
Consequence	9. Suddenly, Albert was pulled through the water into a boat. 10. He had been caught by a fisherman.
Reaction	11. Albert felt sad 12. and wished he had been more careful.

the social, physical, or temporal context in which the remainder of the story occurs. An episode is the main structural component of the simple story. Each episode contains some type of initiating event or happening that evokes a response from the protagonist causing him or her to formulate a goal. In turn, the protagonist's response causes him or her to perform some type of overt action resulting in the attainment or nonattainment of his or her goal. The final event in the episode is the reaction, which can include either the protagonist's response to goal attainment or a broader consequence caused by the protagonist's goal attainment. Thus the basic episode in most stories contains:

1. an initiating event;
2. an internal response, which includes the goal of the protagonist;
3. an attempt or overt action on the part of the protagonist;
4. the consequence, involving the attainment or non-attainment of the goal; and
5. the reaction, stating the character's response to or indicating the indirect consequences of his or her goal attainment.

According to our grammar, a story should contain these five categories in an episode, plus the setting.

Temporal Organization of Stories

If our grammar has general validity, then several predictions can be made about the encoding of incoming information and the retrieval of stories during recall. The first set of predictions concerns those variables that regulate children's ability to produce the correct temporal sequence of events in a story and to retrieve the maximum amount of information upon recall. Predictions about memory for the temporal order of story events are related to one of the functions of stories mentioned in the beginning of this paper—their ability to provide a mechanism for teaching children about sequences of time contrary to those that are expected. Although this function of stories appears to contradict some of the following predictions, we will see that children as they develop begin to acquire rules that allow them to comprehend sequences that *violate* the expected sequence of events in a story. For the moment, however, let us concentrate on the types of predictions implied by the story grammar.

If the temporal organization of the text structure of a story corresponds to the structure described in our grammar of simple stories, listeners should have little trouble recalling the exact order of events in any given story. In our initial story recall study (Stein and Glenn, 1977a), we showed that children as young as six years made few if any temporal ordering errors during recall. Since the completion of this study, data have been collected on children as young as four and five years of age (Stein and Garfin, 1977); and the results have shown that even these pre-school children have very little difficulty recalling stories if the sequence of events is arranged in the expected temporal order. This finding is important because it contradicts the data of

Piaget (1960) who found poorly organized story recall in children of six and eight. The difference between Piaget's results and ours is probably due to differences in story complexity, in terms of both the syntactic structure of individual sentences and of the relationships that occurred among the sentences. While both his stories and ours were relatively short, our stories were constructed more simply in terms of syntax and the logical organization of categories. It is not surprising that the issue of story complexity is critical in the examination of temporal output of story events (that is, in the examination of the sequence in which children recall story information) or that the presence of complexity often leads to an incorrect inference concerning children's cognitive abilities in remembering stories.

Our results with pre-school children are also surprising in the light of Brown's (1975) findings that although five year olds were able to reconstruct sequences that represented cause-effect relations, these children still experienced some difficulty recalling the exact order of events. In our studies with younger children, we have been very careful to maintain the exact sequence of events as specified in the story grammar. Moreover, we have constructed stories whose content was initially collected from four- and five-year-old children. When these techniques were used, even pre-school children made so few temporal sequencing errors that recall skill in pre-schoolers must be reevaluated. It may be that the narrative structures presented in Brown's studies were somewhat unfamiliar in terms of content or that not all statements in the narrative were perceived as being directly related to one another. Our results indicate that young children can organize and recall story information according to the logical sequence outlined in the grammar. A more stringent test of children's organizational skills, however, requires the examination of stories that *violate* the rules proposed in the grammar.

Stories containing temporal inversions of information can be created using two methods. They can be constructed so that the information in one part, say the end of the episode, is simply moved to the beginning of the story without any change in the content of the story information other than the repositioning of one type of category. A second method of inverting information is to reposition the information and also to include linguistic or rhetorical markers that signal the occurrence of the change in position. The function of these markers is to alert the listener to the fact that the events are occurring in an order different from the normally expected sequence. We have investigated the effects of both forms of temporal inversion on children's recall.

Our first set of studies manipulated the order in which certain types of information occurred in stories, without including any linguistic markers indicating that inversions had occurred. The prediction was that children would reorganize the material to conform to the expected story sequence described in the grammar rather than to the presented story sequence. Furthermore, we predicted the recovery of accurate story information might be quite difficult when certain temporal inversions occurred. If subjects do expect certain relationships to occur between parts of a story, they may become confused when sequences contrary to their expectations are presented. As a result of the confusion, they may spend more time attempting to reorganize parts of the story which contain confusing elements and therefore may not attend to other parts of the incoming information.

Both of these hypotheses were confirmed when recall protocols from children were examined (Stein, 1976). When the initiating event, the internal response of the protagonist, and/or the consequence of the protagonist's actions were moved from their normal position in a well-organized story to other locations within an episode, almost all subjects attempted some form of reorganization to make their recall conform more closely to the expected sequence described in the grammar. Furthermore, when either the initiating event or consequence was placed in a position other than its normal location in a story, the amount of accurate recall decreased significantly in comparison to that from groups receiving well-formed stories. *Figure 2* contains the recall results from this study.

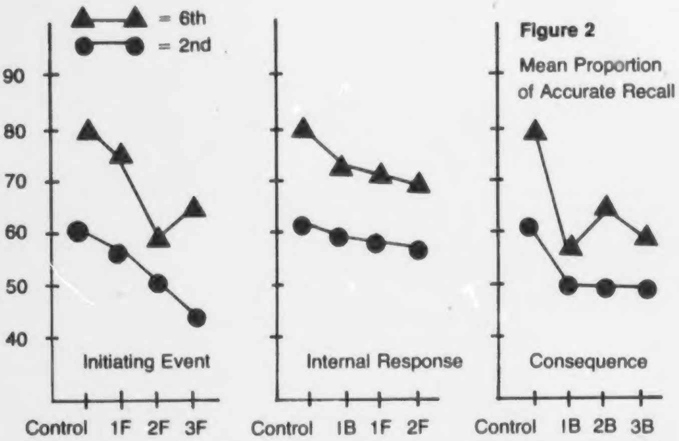


Figure 2
Mean Proportion of Accurate Recall

The surprising finding in this study was that the category containing internal response information could be placed anywhere in the episode without decreasing the amount of information accurately recalled. Subjects, however, did *reorganize* story information independent of the type of information moved. Thus, the hypothesis that the incoming *order* of events is a critical variable in accounting for the recall of stories was upheld. Furthermore, the fact that subjects in almost all instances made well-formed stories lends further support to the notion that schematic control over memory is quite strong.

What happens when well-marked temporal inversions occur in stories? This type of manipulation is so frequently used in written stories that it is imperative for us to look closely at the techniques used by writers to see if specific inversions facilitate comprehension and recall. In a second experiment (Stein and Nezworski, 1977), we manipulated the position of three different types of story information by systematically placing each type of information in different temporal locations throughout the story episode. Six-year-old and ten-year-old children participated in this study. The results were very exciting both in terms of developmental differences in recall and the types of reordering of story information. For fifth-grade children, not one condition containing a marked temporal inversion decreased recall below that of the control condition, which contained well-formed stories. In other words, the presence of markers enabled the older group of subjects to recall as much story information as children receiving well-formed stories. More importantly, when results were compared with those from the control group, three types of marked inversions increased recall significantly. Each of these inversions contained some manipulation of the internal response of the character (such as a thought or an emotional response that the protagonist was experiencing). The two conditions that were more effective in increasing recall involved placing the internal response either before the initiating event or after the character's reaction. Thus, recall is better when the correct position of a character's emotional state or affective state is reversed so that it follows rather than precedes the statement of the character's action.

This result fits very nicely into Piaget's predictions concerning how children acquire rules for comprehending "because" relationships, and it has been documented to some extent by Corrigan (1975). She showed that an affect-action relationship is one of the first types of inverted relationships that children understand. It is unclear at the present time exactly why these types of inversions facilitate recall when inverting two actions does not. One hypothesis that might explain the facilitative function of this inversion concerns the relative salience of a character's internal response in a normally ordered story.

Salience of Category Information

In our initial story comprehension study (Stein and Glenn, 1977a), one of the results showed that when children heard stories in a normally ordered sequence, certain types of information were always recalled better than other types. Setting statements introducing the protagonist, initiating events, and consequence statements were always more salient than attempts, internal responses, reactions, and setting statements describing contextual information. In recalling most stories, children consistently deleted many of the protagonist's internal responses. Developmental differences were found in the number of internal response statements recalled, with older children recalling significantly more internal responses than younger children. Nonetheless, all children still recalled fewer internal responses than other types of category information.

One reason for the low saliency of internal response statements is the redundancy occurring among story statements. If the information in the internal response category is implied by or is an elaboration of a previous item, there may be no reason for a subject to include both statements in recall. When the internal response is not positioned in its correct location but is stated at the end of the episode, however, it may become more salient because it alerts the listener to the fact that his or her initial inferences about the character's internal states may have been incorrect. An excellent example of this can be seen in a recent study completed by Austin, Ruble, and Trabasso (in press).

Austin et al. have shown that in stories where a positive intent (a protagonist wants to do something good) is stated before a negative outcome (the consequence of the protagonist's actions is seen as being bad), young children will infer that the character's original intentions were negative. When the intentions are moved to the end of the episode, however, children will maintain that the character's intentions were good despite the negative outcome. Austin et al. attribute the changes in moral judgments to the fact that a recency effect occurs when the intention is stated at the end of the story. They indicate that the recency effect could cause children to integrate and to weigh the story information differently when intentions occur at the end of a story rather than when they occur before the consequence.

The results from our study (Stein and Nezworski, 1977) are basically in agreement with theirs. In fact, we have an additional hypothesis concerning this type of temporal inversion. We hypothesize that the main effect of this inversion may prevent listeners from making an incorrect inference concerning a possible change in the character's initial intentions.

Although stories often explicitly state the intent of a character, actions occurring after the protagonist's goal statement can often cause children to make additional inferences about the protagonist's intent in the story. These inferences can then become more salient in determining just what children remember from a story. The inclusion of temporal inversions, especially in connection with intentions, should limit the type of inferences made, ensuring that the listener remember very specific information. The inversion tells the listener that there was no ambiguity about the protagonist's intentions *throughout* the story episode. Thus it is evident from the Austin et al. study and from our results that certain temporal inversions can facilitate recall and comprehension of stories for a specific age groups.

The results from the younger age group in our study, however, introduce a new question regarding certain marked inversions. Although some of the stories with marked inversions were retained as well as well-formed stories, *none* of the stories including inversions was recalled better. Moreover, recall of stories with an inversion of information other than the internal response was significantly poorer than that of well-formed stories. Thus, we see an important developmental difference in the effects of marked inversions on recall memory: even when markers occur in stories, younger children cannot handle certain deviations from the expected sequence as well as older children. These data indicate that the younger children may not have acquired the specific sets of strategies or rules necessary to aid them in recovering the original structure of the story. Younger children may in fact depend more upon the expected sequence of events than older children. This assertion has been supported not only by our studies but by studies completed by Mandler and DeForrest (1977). They contend that younger children are less familiar with deviant structures and that therefore their memory for stories is more apt to decline with any type of deviation from the expected sequence.

It is clear from both our studies and those of Mandler and DeForrest that if this hypothesis is true, then the next question is how children acquire strategies or rules that allow them to maintain a high level of comprehension when temporal inversions do occur. A second question of importance concerns the order in which these rules are acquired. It is clear that younger children remember some types of temporal inversions more easily than others. This finding suggests that when remembering the content and structure of a story, some inversions may be more easily represented or may require fewer transformations during encoding. If so, we must begin to identify the types of representations and transformations necessary for children to maintain a high degree of accuracy when recalling story content and structure.

A final concluding thought on the role of temporal organization: after viewing and reading a number of stories using temporal inversions as an artistic technique, one develops the feeling that writers do not use these techniques for the purpose of having the reader retain an accurate account of all story events. It appears that one of the major reasons for using temporal inversions might be to force the reader to make certain types of inferences not made under ordinary circumstances. Often events that are causally related to one another are extremely distant from one another in the story sequence. By making them contiguous in a story structure, the temporal sequence in which the events occurred is violated, but the relationship between two events that would normally go unnoticed becomes more salient. Thus, depending upon the information inverted and the age of the child, inversions in stories have the potential for being either detrimental to or facilitative of comprehension.

The Effect of Missing Information

The next set of predictions implied by the rules of our grammar concerns the types of information that must be included in a story if it is to be well comprehended or accurately recalled. If listeners do expect certain types of information to occur in specific places, then stories conforming to the expected sequence regarding the inclusion of *all* categories should be well remembered.

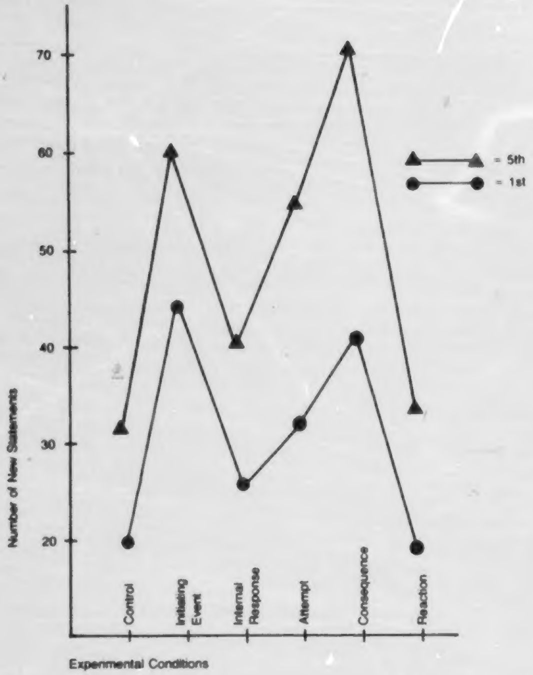
In order to test the importance of each category in predicting the accuracy and completeness of story recall, an experiment systematically deleting each category was completed (Stein and Glenn, 1977b). By deleting in turn each one of the categories from the surface or text structure of a story, the importance of that category could be examined by analyzing recall data in one of two ways. When deletions occur in stories, a "gap" is created in the logical sequence of events. If a schema has been activated to guide the listener in the processing of story information, he or she should attempt to fill in the gap during recall by generating new information that perpetuates the logical sequence of events. If the grammar is valid, the majority of new information should replace deleted information. In situations where the listener has difficulty discerning the exact nature of the missing information or is unable to make inferences about what could have appeared in that category, then the logical sequence of story events should be disrupted, thereby decreasing recall of the remaining story information.

There may be certain exceptions to the above predictions. Again, most of these exceptions concern the categories of internal response and reaction. In examining many written folktales, we have found that these two categories are often deleted from the structure of an episode. Because the internal response and reaction categories are among the least well recalled types of information in an episode, it appears that subjects may have rules that allow them to delete these two categories from recall without any disruption in the process of recalling the remaining story information or without adding additional new information to the episode. The information contained in these categories is often so apparent from the other events in a story sequence that it becomes redundant to recall them.

The results from our experiment (Stein and Glenn, 1977b) with first-grade and fifth-grade children confirmed these hypotheses. When initiating events, attempts, and consequences were deleted, the number of new statements included in recall significantly increased in comparison to those generated by the control group. Also, a clear majority of the new information generated matched the type of information deleted from the story. *Figure 3* shows the number of new statements in recall as a function of the category deleted. *Figure 4* shows the type of inferences occurring when each category was deleted from the story. Thus, the tendency to create a reasonable logical sequence of events by adding new information is quite strong when specific types of information are deleted.

A second finding of importance is that recall in both groups of children decreased significantly in comparison to a control group when the initiating event was deleted from the story. Recall also decreased in the first grade when the consequence was deleted. The in-

Figure 3

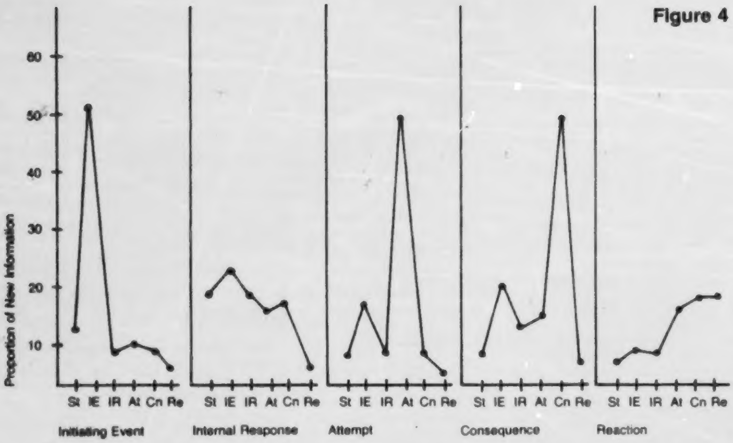


formation lost under these conditions may indicate that children had difficulty generating new information that was congruent with the entire sequence of events occurring in the story. Children often generated new information that could be connected to specific parts of our original story but not to other parts. In order to make the story more coherent, some children would then transform more of the original story to make it fit with the new information they had generated to fit the deleted category.

Thus, we can see that when certain classes of information are deleted from a story, children will attempt to fill in the missing information, but often at the cost of losing recall of other story information. Although this study is only a beginning attempt to investigate the effects of structural variation in stories on children's memory, the results have made us ask several important questions about the development of inferential thinking in children as it relates to their comprehension of stories.

Writers often try to make stories exciting to adult readers by including ambiguity, suspense, or an outcome contrary to the readers' or listeners' expectations. It is my contention that these devices often initiate a chain of inferential thinking in the reader as he or she attempts

Figure 4



Category Distributions for New Information Included in Recall when each of the Episodic Categories Was Deleted from the Structure of a Story

to fill in the details and make the sequence of story events more coherent. Trabasso and his colleagues (Trabasso, Nicholas, Omanson, and Johnson, 1977) have similarly argued that the major function of making inferences is to resolve ambiguities and contradictions occurring at different linguistic levels in the story text. In the process of making references to reduce ambiguity and resolve contradictions, a reader will often connect information so that the connection results in the formation of new knowledge.

After reading a story, people often have the feeling of "solving" or understanding a problem in a new frame of reference. It is the transformation of existing information into different structures that motivates people to read stories. A dilemma again arises. The presence of ambiguity or contradiction, while increasing the number of inferences and new structures, may decrease the amount of accurate information remembered in the story. Therefore, it is imperative that we begin the systematic study of the effects of these artistic techniques, especially as they relate to the development of story comprehension skills. The effects of these techniques may not be similar when either children's or adults' comprehension is examined. There should be differences in the strategies and knowledge structures each group brings to the task of story understanding.

Although adults may lose some information when a story is ambiguous or contains contradictions, they are frequently aware of the effects of these techniques, and they have often developed strategies to contend with the loss of information. In fact, some adults read novels or mystery stories twice: once in order to understand the plot structure and a second time to encode the variety of details that are directly related to the unfolding of the story's conclusion. Thus adults during an initial reading will often miss critical details that would help them resolve ambiguities, but during a later reading they will go back and encode the material missed earlier.

We do not know the extent to which children can perceive the ambiguity in a story or whether they attempt to reconstruct poorly understood segments of a text. One factor that appears critical for the initiation of inferential thinking, however, is the ability to recognize, consciously or not, that a story is ambiguous. It seems that we need to investigate whether children are aware of ambiguity and whether they are aware of the fact that making certain types of inferences in stories is critical for a complete understanding of events. Another problem is to determine what skills children have in making certain classes of inferences and how much knowledge they have concerning various literary devices.

We have begun a study investigating the types of materials in which children will perceive contradictions in a story. If we give children material in which we feel there is discrepant or contradictory information, will they in fact recognize the ambiguity or discrepancies? In one of my experiments (Stein, 1977), I created stories containing extremely discrepant information. The discrepancy was created by describing the personality characteristics of the protagonist in either a very positive light or a very negative light and then varying the types of activities in which the protagonist participates. The activities were always at odds with the initial description of the protagonist. For example, one story describes a fox who was very mean and who would never think of helping anyone achieve any goal. Later in the story, however, the fox sees a bear who is very weak and looks half-starved. The bear is trying to catch a fish for dinner and is having absolutely no luck getting his supper. The fox walks over to the bear and catches the fish for him and helps him cook it for dinner. The bear is grateful to the fox for doing so. Neither the explicit plans of the fox nor the reason for the change in his behavior was included in the story. Thus, the story contains incongruent elements.

Children in the first and fifth grades were tested on these stories in two different ways. In the first task, we asked the children to recall the story exactly as they heard it. In the second task, however, we told the children that there may have been missing information in the story they heard and that they were to reconstruct the story adding anything they thought was missing from the original version.

The results in the first recall task indicated that a significant number of first-grade children simply deleted the initial description of the fox and recalled only the actions that he participated in. Even when recalling the story the second time, there was very little mention of the fox's meanness or his lack of desire to help others. These children simply deleted the parts of the story that were incongrous and constructed their recall in a more logical fashion. In the fifth grade, however, most children included the initial description of the fox plus all of the fox's subsequent behavior. In an effort to maintain logical consistency, some of the fifth graders included inferences about the fox's reasons for changing his usual pattern of behavior toward other people.

When the recall protocols from the second task were examined, even more of the fifth-grade children included inferences about why the fox had changed his mind about helping the bear. Thus, we can see that children at different age levels respond differently to the conception of contradiction. First graders almost always deleted material to remove the contradiction between the fox's previous behavior and his expressed behavior in the episode. Even when these children were prompted about the initial description of the fox in relation to his behavior in the story, some of the first graders did not see the necessity of giving an explanation for the change in the fox's behavior pattern.

Several possible explanations could account for these findings. First-grade children may not understand that there is any real discrepancy between how the fox reacted in the story and how he reacted in the past. The child's conception of "a fox who would not help anyone" may not have been applied to the acquisition of food under starvation conditions. Even though our statement about the fox never helping anyone was unambiguous, we do not know exactly what conception children have of helping. Moreover, even if these younger children understood the contradiction between the previous and later behavior of the fox, they may not have been able to generate a reason for the change in his behavior. Therefore, the most efficient method of constructing the sequence of events would be to delete that information not directly related to the remainder of the story content.

Although the presence of ambiguity and contradiction are important factors in initiating chains of inferential thinking, the question that must be answered concerns the perceptions of these variables. Does the young child perceive ambiguity? What is his or her knowledge about contradiction? If the young child does perceive it, does he or she have enough knowledge to resolve a contradiction between events in a story? It is apparent that if children are to understand the story as an art form, we must begin to define exactly what the various types of artistic techniques are and to determine exactly how they are understood at different age levels. Moreover, it must be kept in mind that there are many different ways to "understand" stories. The results from our first series of experiments indicate that young children may not grasp the meaning of a story if certain techniques are used, whereas older children and adults may have acquired sufficient knowledge and strategies to understand a story at deeper levels of meaning.

From our initial research on story memory it is evident that the study of inferential thinking in both children and adults is of great importance. We need to know when inferences are made during the comprehension process and what types of inferences are made. If we are to achieve this goal, it appears that several factors not considered in our initial story grammar must be added to provide a more thorough description of the structures used to understand stories. For example, one of the major variables only globally considered in the grammar concerns the specific semantic content of a story.

It is evident from analyzing data from our recall studies and from children's spontaneous construction of stories that certain themes are contained in older children's stories that never appear in young children's narratives. Although all children might tell stories that contain threats to their survival, older children proceed in a very different fashion than younger children. Some of the primary factors that seem to differentiate the content of stories are children's perception of personal causation, their notions about intentionality, and their perception of themselves in relationship to their environment. The comprehension and production of stories depends upon the listener's knowledge of the objects, persons, actions, and events that occur in the story. In his presidential address to the American Psychological Association, Bower (1976) discusses the development of story grammars. What appears to be missing, according to Bower, is concepts about the structure of specific knowledge of story events.

In our studies of children's spontaneous construction of stories, the necessity of studying the specific content of narratives becomes evident. The type of plans generated, the number and type of obstacles created for the protagonist, and the constraints placed upon each character vary as a function of the age level of the child. A taxonomy of the different themes occurring in children's narratives and the changes occurring in knowledge structure as a function of development needs to be developed.

Both Gardner (1973) and Sutton-Smith (1975) have begun to conceptualize those factors necessary for such a taxonomy. We have drawn upon their work in order to begin a systematic description of these factors. Additionally, we have also found the work of De Charms (1968) and Loevinger (1976) helpful. These investigators have attempted to construct formal theories of ego development and the development of personal causation. Because stories inevitably relate to both of these topics, it should be clear that knowledge of these areas is essential for understanding more about stories as an art form.

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Howard Gardner / *A Response to Stein*

From Melvin to Melville: On the Relevance to Aesthetics of Recent Research on Story Comprehension*

The "New Look" in Story Research

The line of research described in Nancy Stein—I will call it the "new look" at stories—is singularly promising. In fact, it seems to me that the general approach in which she (along with David Rumelhart and Jean Mandler) has ingeniously pioneered could serve as a model for research in the psychology of the arts. She has selected a problem of undeniable centrality in the arts—the understanding of stories—and has applied to it the sophisticated analytic tools and methods evolved by contemporary cognitive and developmental psychology. In my view, progress on a variety of fronts in the psychology of the arts is most likely to come about if this general tack is pursued. Indeed, even as the efforts in linguistics by Noam Chomsky led to a paradigmatic revolution in psycholinguistics, so too the infusion of appropriate concepts and methods from the cognitive and developmental areas may well catalyze parallel advances in the long stagnant area of empirical aesthetics.

Any newly fashioned set of tools is dual-edged, however. Even as there is potential for a powerful breakthrough, so too there is the possibility of miscomprehension or misapplication. I feel it is important to consider some of the limitations and problems in this new look at stories from the perspective of aesthetics. I do this with a ready acknowledgment that Nancy Stein's work—as well as that of some others involved in story research—demonstrates considerable awareness of these problems. At the same time, however, I discern the possibility that artistic aspects of story creation, telling, and understanding

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may well be missed by a too literal adoption and application of the new look. Thus at the risk of caricaturing Dr. Stein's careful efforts, I propose to examine critically current research on story comprehension. This critique, this list of misgivings, will include a consideration of the conceptual and empirical background out of which the new look has emerged, an account of three important perspectives which have been omitted or minimized by practitioners of the new look, and some closing speculations about how narrational competence may be represented in the human mind.

Behind the New Look

Like any fresh approach in the sciences, the new look at stories has a number of identifiable forebears. I would like to point out just four of them, each of which has imposed distinctive directions and limitations on the body of research undertaken over the past few years.

The first and obvious point is that the new look is an offspring of psychological experimentation. As such, it employs standardized tasks, administered in as uniform a manner as possible to a reasonably large population of subjects. By the same token, it reflects the pervasive tendency within experimental psychology to nail down the "basic components" of the domain under consideration—in this instance, to pare down the story until it is as concise and manageable as possible.

While many scientific advances have depended upon such "paring down," it is worth bearing in mind that the phenomenon of interest may be distorted—or even lost—in the process. In reading the "stories" used as stimuli, I have wondered whether they actually qualify as stories, whether—outside of an experimental situation—they would retain the interest of any subject, whether they would endure like a good fable or fairy tale when forced to compete in the marketplace of narratives. As I have somewhat facetiously suggested in the title of this discussion, the distance between Melvin the Mouse featured in Stein's story, and the tales of Melville is enormous—it may in fact be so great that the domain of narration may not stretch across it.

A second, equally obvious point is that the new look uses analyses of language as its model for the study of stories. The assumptions employed, even the terminology of "nodes," "grammars," and "hierarchies," are borrowed from linguistics, specifically from the transformational approach evolved by Chomsky and his colleagues. Whether or not the linguistic model proves appropriate for the analysis of sentences, one can reasonably ask whether it can be stretched to account for stories. May not the stretch be Procrustean? What happens to stories that cannot be adequately described by the grammar? Do they—or does the grammar—go? Do all genres of stories—mysteries, fairy tales, picaresque adventures—utilize the same grammar? Might there not be as many grammars as there are genres, authors, or even types of stories by a single author? As I will suggest later, the fact that stories are made out of words may not in itself justify the use of grammars to specify the processes by which stories operate, and the means by which they are apprehended.

A third point about the new look is its reliance upon data about individuals' memory for stories. That stories be memorable is of course important; but it must not be forgotten that we actually remember stories because we hear them over and over again, often in versions that are far from identical with one another. The typical study in the new look, however, features but a single telling and a single hearing. There arises the possibility that stories will become assimilated to nonsense words and paired-associates—until recently the mainstay of psychological research on memory—rather than to the customary mode in which an aesthetic presentation is encountered repeatedly over a considerable span of time.

A final point is that story research highlights the extent to which a story is comprehended, with the usual measures of comprehension entailing some kind of paraphrase or question-and-answer procedure. Certainly, some understanding of stories is vital, and measures of comprehension are a reasonable place to begin any investigation of narrational competence. Yet I would like to raise the apparently outrageous possibility that there is more to the story experience than simple comprehension—or, at least, that the story is comprehended on a variety of levels. Of importance are the sounds of the stories; the experience of hearing the story over and over again; the impact of the traits of characters; the conflict, tone of climax, and catharsis. I would go so far as to suggest that sheer comprehension—in a College Board or Evelyn Wood sense—is not what the story experience is primarily about. And as modest evidence for this iconoclastic view, I would mention that the children who listen most assiduously to stories are often of an age and competence where they cannot conceivably comprehend in the usual sense. I would indicate, too, the fascination of the general population with stories of great complexity. For instance, the novels of Raymond Chandler and recent movies like *Chinatown, The Godfather, Murder on the Orient Express* are so intricately plotted that it is doubtful whether most audience members could provide an adequate paraphrase. Obviously, the audience is taking away something from such sagas, and this comprehended content constitutes part of the attractiveness of these works. But I fear that, from the viewpoint of aesthetics, the usual measures of comprehension risk missing the core of appreciation at a variety of levels.

What Has Been Overlooked

Even as the background of the new look drives story research in certain directions, it lures it away from other emphases, ones of particular importance to the concerns of this audience. I will mention just three such omissions, organized for convenience in alliterative form as aesthetics, affect, and aptitude.

First of all, as noted above, the materials used in story research are typically deficient from the point of view of *aesthetics*. Audiences would not like them; they are not well crafted; they lack the most alluring aspects of style, characterization, figurative language, and the like. We have already noted one reason for this omission: an understandable desire to render stories simple enough that their major variables can be isolated and examined. Yet, it may well be that in stripping away the aesthetic, researchers have also distorted the story.

I can cite one bit of evidence in support of this claim. In a simple story which we have used in our own research, we included a refrain—a line repeated a number of times throughout the story. Such a line would typically be omitted from story research because it would contaminate the measuring of memory. We found, in fact, that children remembered the refrain very well, even though the line was marginal to the "point" of the story. Yet it is just such figurative forms that are typically featured in stories, and that may in fact account for much of their appeal and impact.

This minimization of the aesthetic exemplifies an approach highlighted in contemporary psychology, an approach which has been termed "bottom-up," where one employs the most elementary possible instance of a phenomenon and then, if time and resources permit, slowly builds up to a more veridical exemplar. But it seems to me that if one wants to be sure to capture the aesthetic aspects of a work, it might make more sense to begin "at the top," with an unambiguous instance of the genre—say, a classic short story or children's tale—and then, if time and resources permit, to pare it down to its basic elements.

A second facet largely missing from the new look is that of *affect*. I do not refer here to disembodied affect—from my vantage point, affect is always intertwined with an individual's cognitive capacities. Rather, I allude to that fascination, amongst story-listeners of all ages, with those characters bearing strong affective tones: evil witches, mistreated stepchildren, scary monsters, potent giants. Audience members may be terrified, delighted, or ambivalent about such affectively charged personages, but in any case, they constitute an important facet of a story's appeal, particularly among the young. By the same token, there are the potent forces within stories that also draw upon wells of affect: tensions, conflicts, climaxes, reversals, and so on. Once again, such forces are typically omitted from stories popular in psychological research.

Equally minimized in the story research are the affective responses of audience members. Admittedly these are difficult to identify and to study—it is no surprise that the advances in psychology over the past few decades have largely been restricted to the cognitive domain. Yet the fact that we do not know how to study these areas does not give us license to ignore or deny them—and those with a vantage point in the arts must take special care that the feeling life in stories, and in story listeners, is not neglected.

Once again, I can offer a scintilla of evidence that affective considerations have their place in story research. In another story that we have used in our research, one of the characters cried. According to the typical new look analysis, such crying is considered an *internal reaction* or a *complex response* and, as such, should not be well remembered. And indeed, such crying was among the features least well remembered by our older subjects who were fifth graders. Yet the youngest subjects—kindergarteners and first graders—remembered the crying best of all phrases in the vignette. I think that this age-related finding reflects the affective centrality of crying for the young child.

A final omission has been any concern with the *aptitude* of subjects for participation in the story domain. Certainly, everyone recognizes that some subjects will perform better than others in any task devised by the mind of a psychologist. Yet I refer here to the more controversial, but more interesting, claim that some individuals may well process the world largely through a dramatic or narrative mode, while others may minimize or even evade the "metaphor of the story" in their own lives. In studying very young children, we have in fact discovered striking differences in the willingness and competence of children to engage in narrational activities (Wolf and Gardner, 1978). Some of those who favor stories have difficulty adopting a configurational, visual-spatial approach to materials; analogously, some of those preoccupied with attention to the physical attributes of objects often eschew a dramatic approach to life. It is far too early to say whether these apparent individual differences can fundamentally affect the way in which individuals approach and comprehend stories, but the possibility that they do exert such an effect must be taken seriously by all those interested in stories, and most especially by those entrusted with their aesthetic aspects.

In the above remarks, I have taken a distinctly critical stance, one which harps on the limitation of this line of investigation. I want to stress, however, that this ploy has been motivated by more benign considerations. It is precisely because the avenue of research described by Nancy Stein is so promising that it requires a hard look; through this procedure, its weaker features can be mitigated and its more pregnant features extended. In these closing remarks I would like to suggest a few alternative approaches, ones that might broaden our conception of how stories are apprehended and represented in the human mind.

Extending the New Look

A first point concerns the medium of presentation of stories. In most of this research, until now, stories have been read to children and have been presented in written form to adults. Little attention has been paid to the way in which the story has been presented and the difference that mode of presentation might make. In fact, however, stories can be—and are—transmitted in a number of contrasting ways: stories can be presented in movies, on filmstrips, on television; they can be read by parents or strangers, or read aloud slowly to oneself as a young child, or read silently and more rapidly in one's adult years. It is entirely possible that the mode of presentation does not make that much of a difference; and yet the sway that stories exert over young children (not to mention most adults) suggests that the ways in which stories are apprehended in life situations should itself be subjected to scrutiny.

My colleague, Laurie Meringoff, has recently attempted such a study. With the cooperation of Weston Woods Studio, she has presented "the same story" to children as a television program and as an orally presented narrative. And she has found that among young school children, the mode of presentation exerts a sizeable effect. To cite just a few examples: Children who view the story on television prove more sensitive to visual detail, they are more likely to cite actions in their retelling, and are more likely to make inferences based on actions depicted on the screen. In contrast, those who have the stories read to them from an illustrated picture book prove more alert to auditory patterns, they are more likely to mention attributes in their retelling, and are more likely to make inferences based on their "extra-book" knowledge of the world.

Even as we should attend to the medium of presentation, we need to consider the diverse ways in which the story may be "represented" mentally, including the possibility that the manner of representation may vary depending upon the medium of presentation, the type of story, or the cognitive style of the child. As I mentioned above, when the new look embraces the grammar model from linguistics, it takes a static approach to the representation of stories. Yet it is certainly conceivable that stories may be represented cognitively in a manner quite apart from language.

Let me mention two alternative possibilities. On the one hand, stories may well draw upon and entail visual-spatial capacities. I do not mean that listeners try to imagine what characters and events look like, though of course we often do just that. Rather I refer to the possibility that the various characters and plot events, the relations among characters, one's own attitudes or feelings in the story, and the changing dynamics among these components, all require some kind of a construction inside one's head of a model of the story—and that those capacities usually termed visual-spatial may well be invoked for this task. At the very least, the notion of a visual-spatial representation of a complex story or novel may be a useful metaphor. And it is quite plausible that the same capacities that seem to be used when we rotate a geometric form in our head are drawn upon when we alter the values or relations among two characters. Should this be so, interference with these processes—whether by the experimenter's interpolation of other tasks or by Nature's destruction of certain areas of the brain—may result in significant difficulties in the representation of narrative materials.

The second possibility is even more speculative, but given the orientation of this audience, I dare to air it. I would like to suggest that stories may well be processed and represented in a musical fashion. Our experience in hearing a story—particularly one told and retold around a campfire or from the proscenium of a theatre or church—may have more in common with the experience of music than with ordinary exchanges of language. The themes, counter-themes, rhythms, variations, balances, climaxes, and the like that clearly dominate our initial processing of a musical piece may also characterize our apprehension of a story. And it may well be that the mechanisms we invoke in parsing and processing a musical work may also be put to good stead in our apprehension of a literary work. To be sure, if one simplifies a story sufficiently, or if one devotes one's energies to mastering it, one will soon transcend a "musical approach," and one will be able to deal with the narrative rather in the manner of a linguistic message. Yet in so doing, one may unduly divorce the story from its evolutionary roots in the communication of deep, powerful, and unifying themes to the members of a group.

Concluding Note

Despite my various cautionary comments, I would not urge the pioneers of the new look to abandon their studies, their methods, or even their models. The new look is proceeding apace and our growing understanding of the narrative domain is due largely to the excellent efforts of Dr. Stein and other practitioners of the new look. What I do urge is that the practitioners peer in other directions as well—back to their forebears, aside to their co-workers in other fields, and inward to the powerful phenomenon of the story experience. I urge that they consider the role of processes other than linguistic in the apprehension of stories and that they even consider the possibility that visual-spatial and musical processes may play a formative and instrumental role in the processing of stories. If they do so, the vantage point of aesthetics will become properly incorporated within this new perspective. By the same token, our knowledge of artistic skills and processes will be significantly enhanced if they are informed by the judicious use of models from cognitive and developmental psychology.

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